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Clinical and Radiological Studies of Pulmonary Mycosis[1]

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SINCE THE FIRST observation of a yeast fungus by Hooke in 1677, many fungi have been described, but only a small number have been found to be pathogenic to animals and man. The identification and classification of the fungus by cultural and growth characteristics are difficult and often involve a tremendous amount of work.

The purpose of this paper is to review and summarize the literature as it pertains to yeasts in their relation to the ills of man, especially of the lungs, and to present several cases of mycotic infection encountered in a relatively short period of eight months. Our review of the literature has been quite extensive and has impressed us with the general distribution of yeast, the insidious manner in which it starts its career in the human host, the diversified manifestations it produces, and the apparent difficulties encountered in making a positive diagnosis. From a practical standpoint, there seems to be sufficient similarity in the lesions produced that the history, tissue findings, roentgen findings, and sequelae of all yeast infections should be discussed as though these were a single entity, and any variation, one only of degree of virulence but not necessarily characteristic for the species. This will simplify the general picture and perhaps encourage clinicians to be more diligent in looking for these infections.

In taking the above point of view, we do not wish to depreciate the fine work which has been done in grouping, subgrouping, and identifying end-strains of these organisms. It may be that at a future time distinctive characteristics for particular types of yeast infections will be worked out by their more frequent diagnosis.

DISTRIBUTION

Yeast infections of all types have been reported from various parts of North America, South America, and Europe. Practically no region can be said to be exempt, though certain infections seem to have a high regional incidence, as coccidioidomycosis, which appears to be endemic in the San Joaquin Valley district of California. The frequency of types under observation may also vary according to the location of the observer.

Susceptibility does not seem to vary with race, color, or age so much as with change in location from a non-infected to an infected area. The infection is not considered to be transmitted from one person to another. For coccidioidomycosis it has been reported that in the early or infectious stages women outnumber men, 2:1, while in the late or granulomatous stages males are more often involved, 4:1.

We took particular notice in studying

[1] Read by title at the Twenty-ninth Annual Meeting of the Radiological Society of North America, Chicago, Ill., Dec. 1–2, 1943.

case reports to observe whether any particular occupation produced more infections than another, but there does not seem to be any occupational prevalence. One of us, however, encounters a large number of cases of blastomycosis of the skin each year, all in farmers raising cattle and in men in packing houses or stockyards handling cattle. Each farmer so infected will tell us that his cattle have sores. Reports from the veterinary departments of two leading universities state that they know very little about the frequency of mycotic skin infections in cattle. In spite of this possible contact, the incidence of pulmonary mycosis among farmers is not higher than among those in any other occupation. By contrast, a newcomer into the San Joaquin Valley very often contracts coccidioidomycosis from the dust, although the natives have little trouble. It is quite certain that the natives of this valley have an immunity; perhaps the same is true for the farmer. We hope to learn more about the skin sores of cattle. At the present time, however, we know little concerning the exact source of yeast infections other than those from the dust of the San Joaquin Valley.

PATHOLOGY

The spores of yeast may persist for many years. They withstand a lot of heat, cold, and drying. We do not know the requirements for a yeast infection; ordinarily the spores grow in a slightly acid medium, whereas the body juices are slightly alkaline under normal conditions. It has been suggested that perhaps some other disease, as influenza, pneumonia, tuberculosis, bronchiectasis, a neoplasm, etc., may produce temporary pH changes sufficient for the organisms to start their growth.

The primary infection most often occurs through the respiratory tract. The organism grows and multiplies in the secretions. Sufficient ulceration of the mucosa must result to permit the yeast to gain a foothold in the lung tissues bordering the bronchi. Yeasts themselves do not seem to attract much defense mechanism by the body, either in the form of cellular infiltration or fibrosis. The extension of the infection, with coalescence into nodules and breaking down into abscesses, may occur from the yeast alone or in conjunction with some associated infection; or areas of bronchopneumonia may develop as a result of an associated disease taking advantage of the damage done by the yeast.

At some stage in the spread of the more virulent infections, either through ulcerations or caseations, or both, a large number of organisms must gain entrance into the blood or lymph stream. These are deposited all over the body, especially in the brain, meninges, liver, spleen, lungs, kidneys, and bones. These lesions appear to grow rapidly and to develop a high degree of "toxicity," since such generalized cases have a very high mortality rate. This is especially true of coccidioidal granuloma and torula infections, but also occurs in moniliasis, blastomycosis, and other mycotic infections.

Probably the majority of yeast infections never get beyond the bronchi; a few reach the peribronchial tissues, the lung parenchyma, and the lymph nodes, and involve the pleura; even fewer are disseminated through the body.

Microscopically the pure lesion of a mycotic infection is a tubercle-like granuloma. The central area is caseous and even in young lesions does not contain epithelioid cells, though it may contain giant cells. The borders of these granulomas may show very little fibrosis and only relatively few round cells. The walls of abscess cavities are virtually the same. Many yeast spherules are found in the contents of the abscesses. Mycoses complicated by other pyogenic infections or a tuberculous infection will also show the microscopic cell structure of these infections.

HISTORY

The clinical symptoms of pulmonary mycosis vary in degree and type, depending upon the virulence of the infection,

extent of development, and rapidity of extension. In mild cases the symptoms are those associated with any pulmonary infection. In some instances symptoms may have persisted for years, in the form of a mild cough, occasional chest pain, loss of energy, etc. A chronic dry cough, often unproductive, is the most common symptom of all; other than this there is no characteristic manifestation.

In severe cases there may be such symptoms as malaise, low-grade fever, occasional hemoptysis, chills, night sweats, and other evidence of pulmonary disease. The sputum often has a foul, nauseating odor; this is about the only sign which may suggest the presence of a fungus infection.

In the disseminating stage the symptoms are all referable to the organ affected. In case of brain or meningeal involvement there may be a history of severe headache as the predominant symptom; other signs referable to the central nervous system may develop, but all of them are the same as in other diseases involving the particular organ. Lesions in the liver, spleen, kidneys, etc., produce few, if any, symptoms.

Physical examination of the lungs often fails to reveal many abnormal findings; occasional râles, alteration of breath sounds, and patchy areas of dullness may be found, but these findings are present, also, in tuberculosis, sarcoidosis, pneumonoconiosis, bronchiectasis, metastatic neoplasms, etc. In some cases physical findings may be marked, but often they do not indicate any severe changes. Frequently the clinician is surprised to see the extensive changes demonstrated by the x-ray film.

While the clinician is the first to recognize the presence of some sort of pulmonary disease, the roentgenologist is the first to learn its extent and distribution and often he can suggest its nature. The pathologist or bacteriologist must make the final diagnosis, since the only unfailing evidence of the disease is the actual demonstration of the fungus itself in the sputum culture or in the culture of secretion directly obtained from the bronchial tree. It is not only necessary for the detection of the disease that it be kept in mind in the differential diagnosis of pulmonary conditions, but also that there be teamwork between the clinician, radiologist, bacteriologist, and often the bronchoscopist.

ROENTGEN FINDINGS

Yeast infections may produce certain pulmonary reactions, depending on the stage, duration, and to a lesser degree the type of the infection. Probably the earliest lesions to be recognized show only slightly increased markings of the bronchovascular structure. There may be some irregular peribronchial infiltration. This may be unilateral and is more often on the right side; later a similar lesion may develop on the left side. Some authors describe enlarged lymph nodes in the hilar zones and upper mediastinum. This finding was not present in our cases, either early or late. Patchy areas of density appear in the parenchyma, mostly along the bronchi. These may be of miliary size or in the form of large nodules. They may increase, coalesce, and break down into abscesses. The lesions may gradually extend toward the periphery and, when they reach the pleura, may produce pleural thickening, which is often localized adjacent to the area of parenchymal infiltration. Pleural effusion is fairly rare. Another type of involvement may show faint fuzzy shadows along the bronchovascular structure, giving it a ground-glass appearance. These shadows extend to the periphery. Later a moderate fibrosis may develop or the lesions may disappear, even without treatment. It is unusual for lesions of this type to break down and form abscesses.

Advanced cases may present still another type of lesion in the lung, which seems to be definitely associated with a general dissemination of the infection throughout the body. One sees discrete nodules in the pulmonary parenchyma, ap-

parently not associated with the bronchi. These are quite dense and not sharply demarcated. The lesions vary in size; some are isolated, while others are more or less grouped in irregular masses. Some of these lesions break down to form abscesses. Draining sinuses may develop, especially in cases of actinomycosis.

During the stage of convalescence, gradual absorption of the parenchymal lesions takes place, abscesses disappear, and finally the increased markings of the bronchovascular structure become less prominent. Under treatment these lesions occasionally seem to melt away like snow. Extensive changes take place in a few weeks, as contrasted to the slow improvement in tuberculosis. As in pneumonia, or more often in tuberculosis, some cases do not clear up entirely but leave chronic cavities and areas of fibrosis.

Tuberculosis may and frequently does develop in a mycotic lung. In most cases it would be difficult to determine which disease occurred first. Regardless of which has priority, the roentgen appearance becomes more confusing and its correct interpretation more difficult. There is a tendency to attach little significance to the presence of yeast, once a tubercle bacillus is demonstrated. This we believe may be a definite mistake. In one of our cases we feel we have ample evidence to prove that yeast is playing a most active part in the lung and that, while tuberculosis is present in an active form, we cannot expect much improvement in the latter until the former is in great part eradicated.

The roentgenographic differentiation of yeast infection from tuberculosis is not at all reliable. Lymph node enlargement, we believe, is more common in tuberculosis. The presence of enlarged nodes in the hila or along the mediastinum, therefore, is more suggestive of tuberculosis than of mycosis or pneumonia. Cavities are considered to be more numerous in tuberculosis, especially in the apical regions. The older lesions of tuberculosis are usually associated with more fibrosis.

Pulmonary sarcoidosis may show enlargement of the hilar nodes, with infiltrations radiating outward into the periphery, and miliary and nodular infiltrations of the lungs. The distribution of the pulmonary lesions may be more symmetrical than in yeast infections. Proved cases of sarcoidosis have shown a great variation in the lesions as they appear in the roentgenogram. Skin lesions or mucous membrane lesions are nearly always present in sarcoidosis, from which biopsies may be taken for differential diagnosis. In both diseases there may be cystic lesions in the bones of the hands or feet. Those caused by mycosis usually are more painful and often have draining sinuses.

Cancer metastases are in most cases larger and progress more rapidly than mycotic lesions. Miliary or nodular densities are fewer in number in cancer patients, and larger areas of inflammatory reaction and of atelectasis are apt to be present. Metastatic lesions show a tendency to be more confined to the lower lobes. The primary lesions are almost always recognizable clinically.

The lesions of active bronchopneumonia are more flame-like, disseminating outward from the bronchovascular structure. There is marked variation in the size of the shadows compared to the more uniform shadows of mycotic infection. The individual densities are less homogeneous in bronchopneumonia and tend to change rather rapidly in size. In cases of delayed resolution of pneumonia and of chronic fibroid pneumonia, one will encounter more fibrosis and often abscesses with thicker walls. Pneumonia rarely involves both lungs in the same degree, either in the acute or chronic stage. The more rapid course of the disease may also be helpful in the differentiation. Cases of so-called atypical and virus pneumonia should also be excluded.

The nodular stage of pneumonoconiosis may be extremely confusing. In this disease the nodules are discrete and usually quite uniform in distribution, most often involving both lungs. In the later stages there may be, and often is, a conglomera-

tion of nodules but rarely abscess formation, whereas in mycotic infections such conglomerations tend to develop into abscesses. In pneumonoconiosis the parietal pleura is often quite dense and rather uniformly so, whereas the pleura of pulmonary mycosis is thickened chiefly where the lesions reach the periphery of the lung. Emphysema in the uninvolved portions of the lungs may be greater in pneumonoconiosis. Fluoroscopically a considerable limitation in the excursion of the diaphragm is demonstrable; this is not usually present in pulmonary mycosis.

TREATMENT

The most universal and most successful treatment of pulmonary mycosis seems to be by iodides and x-ray. Saturated potassium iodide should be given in doses of 30 grains a day in three divided doses. This should be increased 3 grains a day until a total dose of 120–250 grains a day is given. The total dose depends on the weight of the patient and his tolerance. If treatment is carried out as above, not over 4 in 100 will have any difficulty. Severe breaking out of skin nodules or gastric distress may force a lower total dose or sometimes prevent use of the drug altogether. In addition to the dosage by mouth, once it is determined the patient is not allergic to the iodides, sodium iodide should be given intravenously, daily for two to three weeks. Following this, the oral dosage should be ample if given over a sufficient period of time. We have found no proved contraindication to the iodides in the presence of tuberculosis. X-ray radiation is given once or twice a week over the chest and skin lesions, using as a rule not over 100 r per area treated.

Some authors maintain that, in treating moniliasis and blastomycosis, the patient must be desensitized to the yeasts before receiving iodides. This is done by giving Lucas vaccine, 0.1 c.c. twice daily and increasing to 0.8 c.c., for a total of eighteen injections. Immune rabbit serum is also used for desensitizing. Whether or not desensitization should be carried out previous to the giving of iodides in the treatment of other yeast infections, we do not know, nor do we find any such information in the literature. Ethyl iodides are sometimes substituted as an inhalant. The dose is started at 0.5 c.c. and increased gradually to 3.0 c.c. three times a day. Some authors claim to have used successfully 40 per cent iodized oil intrabronchially at weekly intervals.

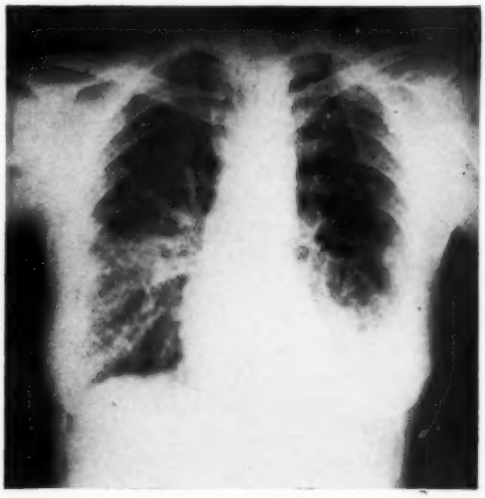

Fig. 1. Case 1: Irregular shadows extending outward from both hilar zones and other evidences of mycotic infection.

CASE REPORTS

CASE 1:[2] B. B., white housewife, age 66. In October 1919, the patient began to cough and to notice blood-tinged sputum. She lost weight, became very weak, and had to remain in bed for several months but eventually recovered. She experienced a similar episode in the summer of 1927. She was then well until April 1942, when she again began to cough. On admission to the hospital, in December 1942, she complained of coughing spells, shortness of breath, and occasional blood-tinged sputum. She had lost 12 pounds in weight.

The patient's temperature was 97.5° to 99.6°. She was short of breath and expansion of the chest was limited on both sides, with dullness in the left lower lung field posteriorly and inconstant râles on the right and left sides.

Blood studies showed hemoglobin 88 per cent; white cells 9,600, with a normal differential count; red blood cells 4,620,000; Wassermann negative.

[2] Reported through the courtesy of K. Hazlet, M.D., Dubuque, Iowa.

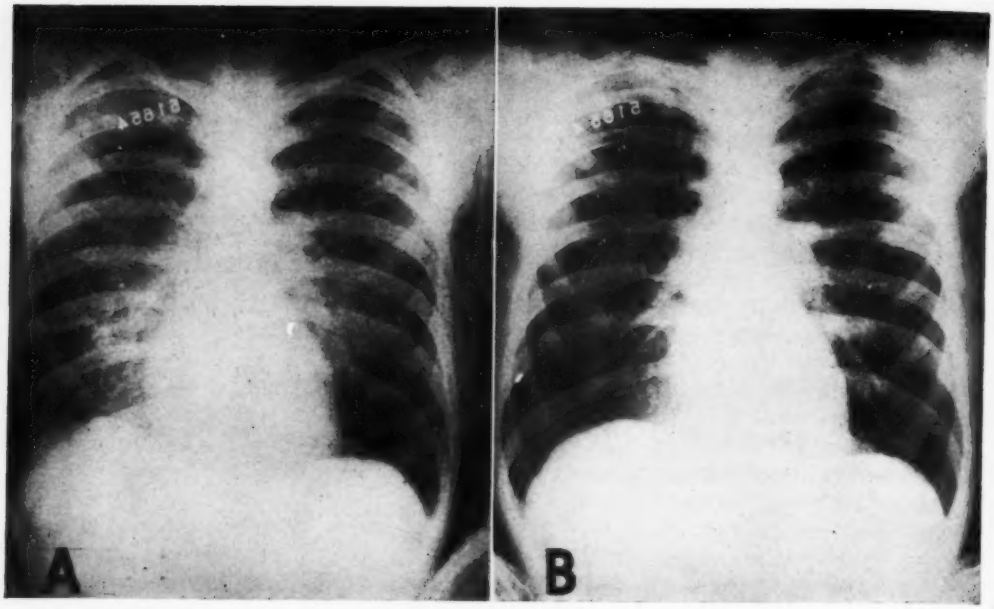

Fig. 2. Case 2: A. Admission roentgenogram showing miliary shadows, especially in the hilar zones. B. Disappearance of lesions following potassium iodide therapy.

Examination of the sputum revealed no predominating bacteria. Culture of the sputum on Feb. 11, 1943, showed numerous colonies of yeast in twenty-four hours. No tubercle bacilli were found in any of several examinations.

Roentgen films of the chest (Fig. 1) showed irregular mesh-like densities extending outward from both hilar zones, decreasing peripherally, more prominent on the right than on the left, and limited mostly to the lower lobes; consolidation in the left lower lobe; increased bronchial markings throughout the upper lobes, with some emphysema; very little if any beading in either lung field. The heart was not unusual.

Clinical Impression: Mycotic lung infection.

Sequelae: The patient left the hospital on April 20, 1943, and died a few weeks later. Autopsy could not be obtained.

CASE 2: J. S., white farmer, age 50. The patient had an acute cold four months prior to admission, severe enough to keep him in bed for four days. Following this he had a persistent cough and dyspnea, though he felt well when in bed. He was referred for study because of increasing weakness and loss of 20 pounds in weight. He was receiving creosote medication.

Physical examination revealed tachycardia (120). There were a few moist râles in the lower lung fields. The temperature was 103° on admission, but returned to normal a few days later.

Blood examination while the patient was in the hospital showed a normal red and white cell count and hemoglobin, but when he was first seen at home the white count was 26,000, with 77 per cent polymorphonuclears. Repeated sputum examinations were negative for tubercle bacilli. Concentrated sputum also failed to show tubercle bacilli. The culture showed no yeast.

Roentgen films (Fig. 2A) of the chest showed prominent hilar zones on each side. Increased bronchovascular markings were present. There was also a mesh-like distribution of miliary soft densities most marked around the hilar zones and decreasing peripherally. The apices were clear.

Sequelae: The patient rapidly improved under potassium iodide medication and left the hospital, after one month, in excellent condition. A roentgen film six months later, Sept. 7, 1943, showed almost a normal lung (Fig. 2B).

Clinical Impression: In view of the absence of tubercle bacilli from the sputum and the patient's rapid improvement under potassium iodide medication, it is our opinion that the pulmonary condition was a mycotic infection.

CASE 3: L. H., white farmer, age 34. The patient had quit farming one year ago because of weakness and vertigo. He had been unable to work for three months because of painful swelling of his feet and legs. Recent complaints were general weakness for three weeks, dyspnea on exertion, diarrhea, increasing insomnia and nervousness. There was a chronic non-productive cough.

The patient's temperature ranged from 99° to 102°; the pulse was 100 to 120. There was slight dullness in the right upper lobe posteriorly. There were no râles. The spleen was palpable. The feet were swollen and edematous. The skin was moist and the patient perspired continuously

The blood examination showed hemoglobin 12 gm.; white count 9,800, with normal differential; red count 4,000,000. The sputum was negative for tubercle bacilli on repeated examinations. Culture of the sputum showed many yeast colonies after several days' incubation. The Kahn test was negative.

A roentgen film of the chest (Fig. 3) showed a large number of irregular feathery nodules scattered throughout both lung fields, but especially in the upper portions. The extreme apices were less involved. There was a tendency to confluence of nodules in the areas lateral to both hilar zones. Multiple cavities were present in the right upper lobe, with pleural thickening in the surrounding region. No definitely demarcated wall surrounded the cavities. Markings in the hilar zones were conspicuously absent. The heart shadow appeared very hypoplastic. An upright film demonstrated a fluid level in one abscess cavity. A film taken two weeks later, one day before death, showed a great increase in the size and number of nodules throughout the left base, with much confluence; the lesser involved area of both lungs showed severe emphysema.

Sequelae: The patient's condition grew rapidly worse. Bilateral foot drop developed after eight days. Speech was difficult the last few days. Death occurred on the seventeenth day after admission.

Postmortem Report:[3] "The right lung is adherent to the chest wall and mediastinal tissues, especially in the upper half. The lung feels hard and nodular. On section it is studded with opaque or semi-opaque yellow areas which are confluent in the upper half. They resemble tubercles but seem less caseated than might be expected considering the degree of involvement in the lung. Toward the apex there are large and small cavities. The left lung is heavy and dark red. The pleura shows a little acute fibrinous exudate over the surface. On section most of the cut surface is dark red, but scattered through it are opaque yellow areas which at first glance resemble abscesses or infected infarcts. On further study they show no evidence of softening and little inflammatory reaction at their peripheries. They vary in size between 0.25 and 1.5 cm. in width and, while largely at the periphery of the lung, also appear scattered through the cut surface. As far as can be made out, the hilar lymph nodes are not involved. Aside from a small and recent infarct on the left, the kidneys are not remarkable. The ureters, urinary bladder, and genitalia are negative. Other organs and tissues are not unusual.

[3] Performed by F. P. McNamara, M.D., Dubuque, Iowa.

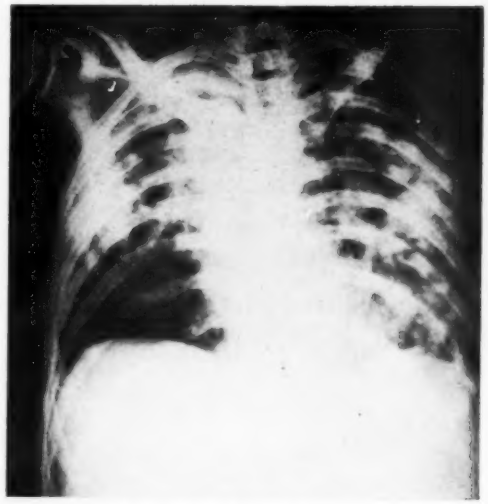

Fig. 3. Case 3: Feathery nodules scattered through both lung fields.

"*Microscopic Findings:* Several sections of each lung show the same picture (Fig. 4), differing only in extent. They show the lesions noted grossly to be irregularly rounded areas of acute hyalinized necrosis. In some the phantom of the lung structure can be made out while in others pyknotic nuclei and nuclear dust indicate more degeneration. Rarely in the sections chosen is there a tendency for the centers of the lesions to break down and form cavities. Occasionally in such areas rounded bodies can be made out, resembling the yeast cells found in the cultures. A striking feature is the scant cellular reaction about the lesions. Usually there are a few round cells, apparently lymphocytes, and more rarely typical giant cells appear. Because of the similarity of the lesions to tubercles, the sections were stained for tubercle bacilli but none were found.

"Similar although smaller lesions were found in the spleen and kidney; the lesion thought to be an infarct also shows the same picture as seen in the lungs. The liver cells are largely replaced by fat globules and there is a slight increase of round cells about the hepatic trinity."

Postmortem Diagnosis: Chronic mycotic infection of the lungs, spleen, and left kidney. Fungus classified as *Monilia krusei* by N. F. Conant, M.D., Department of Mycology, Duke University.

CASE 4:[4] M. D., white housewife, age 28. This patient had an abdominal hysterectomy in May 1942. She had no cough or chest symptoms at that time. Her convalescence was normal. In June 1943 she was sent to the hospital because of cough,

[4] Reported through the courtesy of Luke Faber, M.D., Dubuque, Iowa.

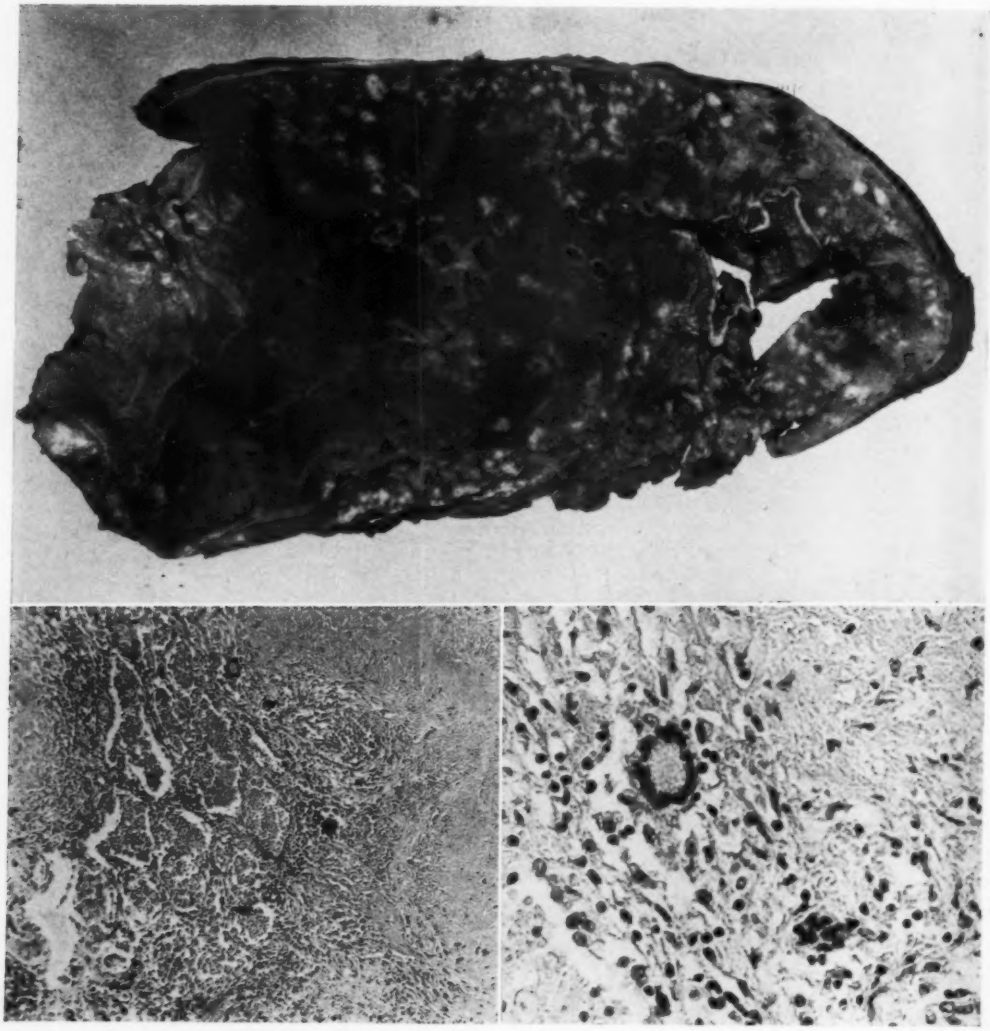

Fig. 4. Case 3: Gross section of lung and low-power and high-power microscopic sections.

weakness, tachycardia, palpitation, profuse sweating, and pain in the lower part of the abdomen. She had had frequent chills during the last four or five months. During her stay in the hospital her temperature varied from 103° to normal. Physical examination showed normal breath sounds, no dullness, no vocal fremitus, and no friction rubs. Heart sounds were normal but a tachycardia was observed. No chest films were ordered during this period in the hospital. A tuberculin skin test was negative. There was no sputum, and only a slight cough was reported one night. The patient left the hospital with a normal temperature and feeling much better at the end of four weeks. She was readmitted three months later with the same complaints and her general condition was very bad.

Physical examination revealed crepitant râles in both lungs with diminished breath sounds and slightly impaired resonance. The right apex was hyperresonant. The patient was coughing a great deal but raised very little sputum.

The blood showed 9 gm. hemoglobin; red cell count 3,000,000; white cell count 20,000 (85 per cent polymorphonuclears). No malaria was found. The sputum showed tubercle bacilli, staphylococci, streptococci, and yeast cells. Very many yeast colonies were obtained by culture.

Bedside X-Ray Examination (*Fig. 5*): "Through-

out the entire left lung and the lower two-thirds of the right lung one gets the impression of the fusion or confluence of a large number of irregular densities interspersed with small areas of emphysema. Upper one-third of the right lung shows large areas of emphysema. No pleural reaction."

Sequelae: The patient died five days after entering the hospital. Permission for autopsy was not obtained.

Clinical Impression: Chronic bilateral tuberculosis and mycosis. From an x-ray standpoint, we feel the predominating densities are more characteristic of mycosis than of tuberculosis.

CASE 5: F. S., white farmer, age 39. The patient gave a history of a hacking cough for a long time and of pleurisy seven years before admission. He had lost weight and experienced pain in the right shoulder in the last twenty-one months. Eight months ago there had been drainage from the mid-part of the right arm. Two brothers died of tuberculosis, one several years earlier and one two years ago. A roentgen film of the chest made elsewhere in 1941 showed chronic fibroid apical tuberculosis of questionable activity. No tubercle bacilli could be found in repeated examinations of the sputum at that time. The chest was re-examined roentgenographically in 1942 in the same laboratory,

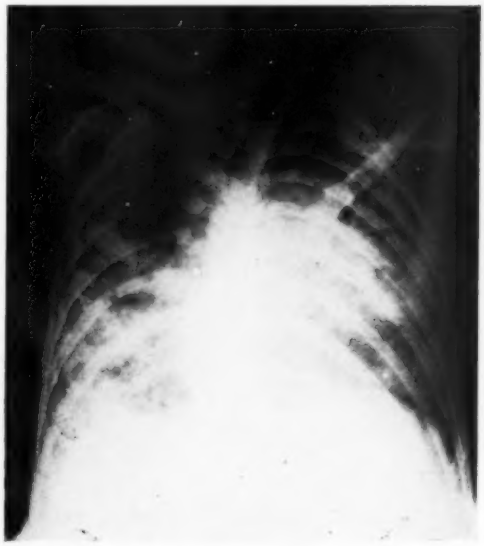

Fig. 5. Case 4: Bilateral tuberculosis and mycosis. Roentgenogram showing confluent nodules and areas of emphysema.

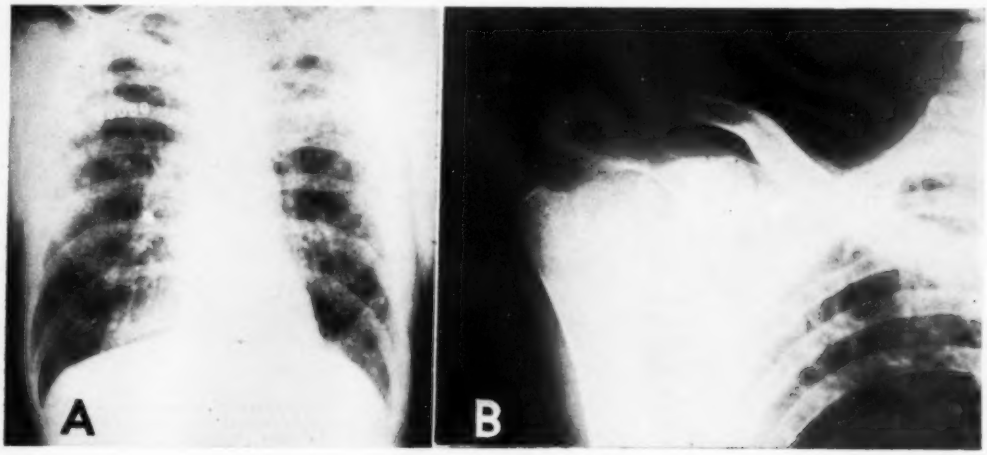

Fig. 6. Case 5: Roentgenogram of chest (A) showing mycotic *or* tuberculous or mycotic *and* tuberculous lesions and (B) of shoulder showing mycotic infection.

and a report was made of "bilateral pulmonary tuberculosis—possibly active." No report was obtainable as to sputum examination. Further x-ray study in May 1943 showed "far advanced pulmonary tuberculosis, bilateral and active."

The patient was emaciated, weighing only 119 pounds. The temperature was 100.3°; pulse 96; blood pressure 105/70. There was severe pain on motion of the right shoulder but no swelling. In the mid-portion of the right arm mesially was a draining sinus, with a discharge of thin, straw-colored, granular fluid. Moist râles were present in both lungs, but especially in the left.

The blood showed hemoglobin 12.5 gm.; red cell count 5,200,000; white cell count 16,300 (76 per cent polymorphonuclears). Smears from the sinus exudate showed masses of yeast. Culture showed a moderate growth of yeast in twenty-four hours. The sputum showed yeast and many tubercle bacilli. Examination of a guinea-pig six weeks

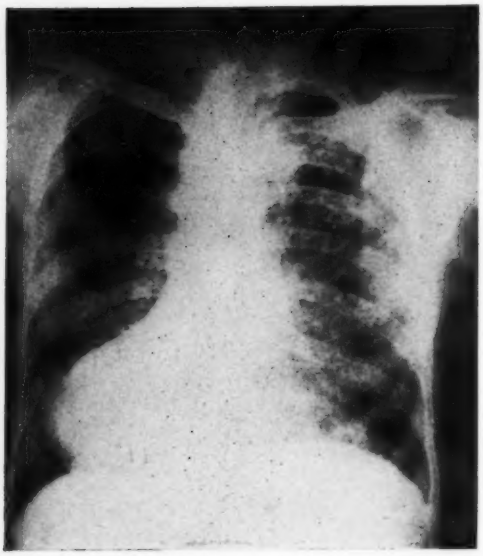

Fig. 7. Case 6: Miliary soft-tissue shadows throughout both lungs, attributed to mycosis.

showed destruction of the head of the humerus without decalcification of the contiguous bone. The greater part of the glenoid fossa was also destroyed. There was no evidence of ankylosis. No proliferative changes were observed.

Clinical Impression: Active bilateral pulmonary tuberculosis of both apices. Mycotic or tuberculous, or mycotic *and* tuberculous infections of both lungs otherwise. Mycotic non-tuberculous infection of the right shoulder.

Sequelae: The patient improved and gained ten pounds in weight under potassium iodide therapy over a period of two months and then lost weight through inability to eat while taking large doses of the drug. At the time of this report the shoulder shows much less drainage but also shows secondary pyogenic infection. The potassium iodide was stopped and the patient is again enjoying his food. Both lungs show definite improvement.

CASE 6:[5] F. B., white farmer, age 70. The patient had never been ill except for the usual children's diseases. About three weeks before admission he became unusually weak and tired, with loss of appetite. He had no cough.

The patient was rather thin and emaciated, with badly infected teeth. The lungs showed a few

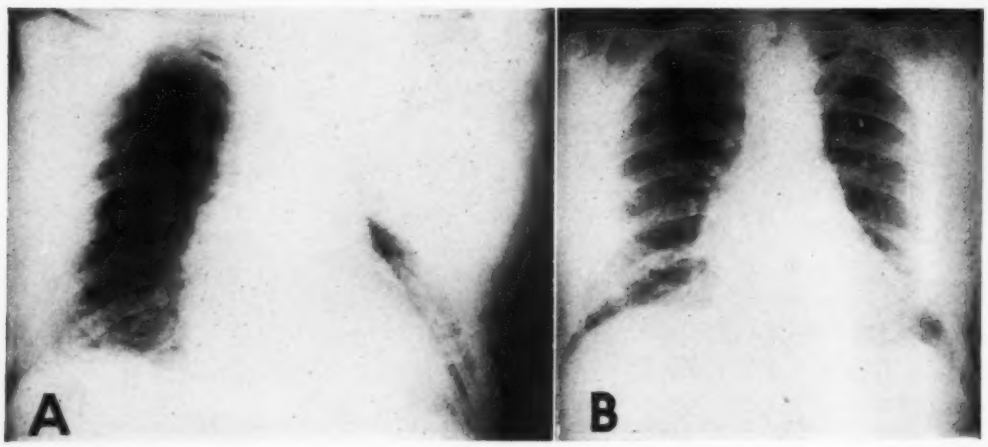

Fig. 8. Case 7: A. Mycotic lesions in right base; traumatic pneumonia in left lung. B. Roentgenogram made two months later, showing resolution of pneumonia; the lesions in the right base persist but are improved.

after injection of the sinus fluid intraperitoneally showed no evidence of either yeast or tuberculosis.

Roentgen films of the chest (Fig. 6A) revealed irregular soft-tissue nodules scattered diffusely throughout both lung fields. These varied in size from 1 to 7 or 8 mm. in diameter, and were especially prominent in the right base. Areas of fibrosis were seen in both apices, as well as possible small cavities. Throughout the left apex and lateral to the right hilum were irregular millet seed-like calcifications. The heart was hypoplastic. X-ray examination of the right shoulder (Fig 6B) coarse bronchial râles. The heart tones were soft but otherwise not unusual. Temperature 103.4°; pulse 95; respirations 20.

The blood showed hemoglobin 14.5 gm.; white cell count 8,650; red cell count 4,500,000. The urine showed 2 plus albumin. The sputum was negative for tubercle bacilli, and a blood culture was negative after forty-eight hours. Sputum cultures were negative for tubercle bacilli. No culture was made for yeast.

[5] Reported through the courtesy of Wm. Schiele, M.D., Galena, Ill.

A roentgen film of the chest (Fig. 7) showed diffuse miliary soft-tissue shadows scattered throughout both lungs, but more in the right than in the left.

Clinical Impression: In view of the failure to demonstrate any tubercle bacilli, we feel that the x-ray findings justify a diagnosis of probable pulmonary mycosis.

Sequelae: The patient died seven days after entering the hospital.

CASE 7: F. A., white male, torch operator, age 61. The patient had always been well except for a fracture of the right tibia several years ago. Two days previous to being seen he fell from a ladder, lacerating his scalp. No skull fracture could be demonstrated. He was sent to the hospital because of pulmonary lesions.

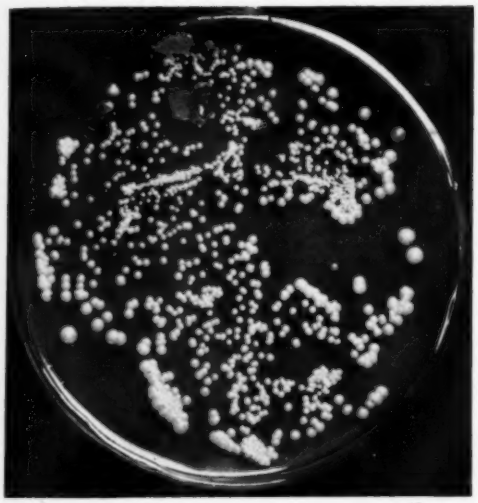

Fig. 9. Case 8: Yeast colonies grown in Sabouraud medium.

The patient was stout and appeared somewhat cyanotic. Temperature 105.4°; pulse 90; respirations 36; blood pressure 156/80. There were coarse râles throughout both lungs with dullness on the left.

The blood showed hemoglobin 82 per cent (Sahli); white cell count 12,750 (57 per cent polymorphonuclears). The urine showed albumin 25 mg. Smears of the sputum revealed a rare leukocyte, a few staphylococci, an occasional short chain of streptococci, and only a rare pneumococcus, too rare to type. Organisms suggestive of a fungus were fairly numerous. Culture of the sputum showed an abundant growth of yeast colonies, classified by N. F. Conant, M.D., as belonging to the type *Monilia pseudotropicalis*.

A roentgen film of the chest (Fig. 8) revealed consolidation of the entire left lung, except for an area just below the left hilum, and displacement of mediastinal structures to the left. There were increased bronchovascular markings in the right base.

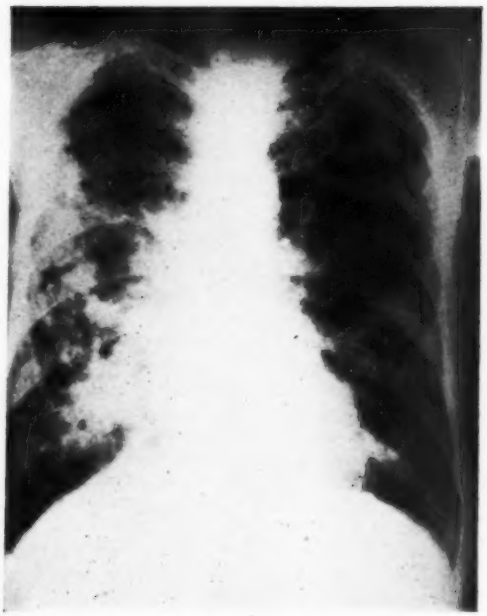

Fig. 10. Case 8: Probable mycotic and bronchiectatic lesions.

Sequelae: The temperature returned to normal on the third day after admission and the patient left the hospital on the thirteenth day, feeling fine.

Clinical Impression: Post-traumatic atelectasis and pneumonia; bilateral mycotic infection of the lungs as an incidental finding.

CASE 8: J. S., white mail carrier, age 70. The patient had not been in good health for twenty years. He had always raised a lot of purulent and offensive sputum and was confined to bed several times each year with lung infections. Roentgen films several years previously showed extensive bilateral abscesses. One quart of cloudy straw-colored fluid was aspirated from the right chest in 1938. The present illness began three weeks before admission, with chills and fever. The patient coughed up continuously a profuse amount of foul, purulent sputum. He had no appetite and had been losing strength rapidly.

The patient was emaciated, breathing rapidly, giving the appearance of being seriously ill. The chest was emphysematous. The lungs showed impaired resonance at each base with moist râles throughout. The heart tones were pure and the action was rapid but regular. Temperature 102.4°; pulse 120; respirations 35.

The blood showed 68 per cent hemoglobin (Sahli); red cell count 3,780,000; white cell count 27,800

(75 per cent polymorphonuclears). The urine showed albumin 20 mg. per cent and a few granular casts. There were numerous pus cells in the sputum, with a few gram-positive cocci, some of which tended to form chains while others appeared intracellularly in clumps. No acid-fast organisms were found. Cultures showed staphylococci and streptococci. Culture on Sabouraud medium after three days showed a profuse growth of yeast colonies, as illustrated in Fig. 9.

The report of roentgen examination of the chest, just previous to the patient's entrance into the hospital was as follows: "Bizarre, fuzzy shaped densities throughout the entire right lung and the lower lobe of the left lung. The densities vary greatly in degree and size. Small, thin-walled cavity adjacent to the parietal wall beneath the third rib on the right side. Marked thickening of the pleura over this region. Marked secondary emphysema throughout the uninvolved portion of both lungs. X-ray conclusion: Bilateral chronic bronchiectasis. Type of x-ray pathology would suggest pulmonary mycosis or unresolved pneumonia as a cause."

Clinical Impression: Chronic bronchiectasis and chronic pulmonary mycosis. No evidence to show which came first.

Sequelae: Patient died three days after entering the hospital.

CONCLUSIONS AND SUMMARY

1. Classification of yeast infections is a difficult procedure and one to be undertaken only by those with considerable experience and with facilities with which to study fully cultural and morphological characteristics.

2. A review of the literature dealing with mycotic infections of the lung demonstrates little, if any, difference between the history, physical findings, pathology, and sequelae of the various types of yeast infection.

3. The recognition of possible yeast infection is in great part the responsibility of the roentgenologist, and it is also his duty to stimulate any further study required to eliminate or prove that possibility.

4. The reported cases demonstrate some of the difficulties encountered in evaluating the importance of yeast in the sputum. There may be a pure infection; there may be a secondary infection which assumes a primary role in extension of the original disease, the secondary disease, or both; the yeast may be an incidental finding of no clinical significance; it may be a contaminant from a receptacle unless proper precautions are used.

5. We feel, from a limited experience, that yeast infections are much more prevalent than ordinarily thought. As proved in the literature and in the cases reported, too many mycotic infections go unrecognized until shortly before a terminal condition exists. It is hoped that this paper may encourage research to find an early means of diagnosis and stimulate a consideration of mycotic infections in the differential diagnosis of diseases of the respiratory tract.

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Fungus Disease of the Chest[1]

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FUNGUS INFECTIONS are not rare in man. While the skin is the most usual site of inflammatory reaction, the lungs and bones are frequently involved. This paper presents a group of proved cases of infection of the lungs due to Coccidioides, Actinomyces, Aspergillus, Monilia albicans, Torula, and Blastomy-

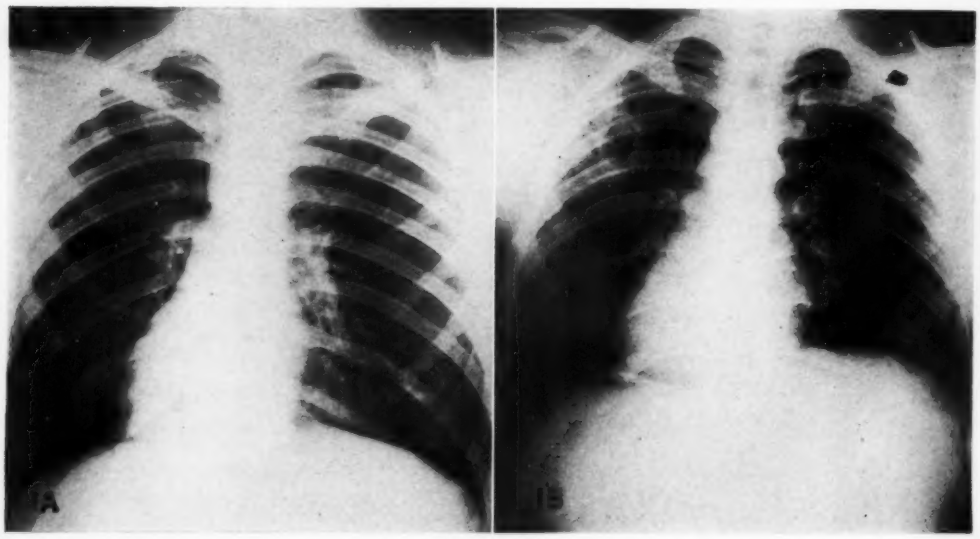

Fig. 1A and B. Coccidioidomycosis: A. Local exudative infiltration, right lower lobe, with thin-walled cavity. B. Irregular exudative infiltration, left upper lobe, with thin-walled cavity.

ces. In approximately one-fourth of these cases there were fungus infections elsewhere in the body when the patient was first seen. The presence of extrapulmonary lesions is an aid in the differential diagnosis of the lung lesion. A careful correlation of the clinical evidence of disease along with the roentgen evidence will usually enable the physician to make an accurate diagnosis.

The roentgen diagnosis of pulmonary disease is based upon the variation from normal of the ventilating, vascular, and lymphatic systems, as well as the supportive framework of the lung and chest. An acute inflammatory lesion of the lungs is recognized by its uniform density, exudative in character. Later, as the lesion stimulates the production of fibrosis or leads to a cavity formation or varies in density because of a spread or clearing of the exudative reaction from the periphery, it is recognized as chronic in nature. In addition, certain lesions involve the bronchi or the alveolar portion of the lung primarily and are situated in characteristic locations in the lung fields. It should be noted in fungus infections that the clinical history may be of little value and that the radiographic picture may simulate any type of known inflammatory process in the lung. At times, the lesion may resemble metastatic or primary carcinoma, lymphoblastoma, or leukemic infiltration.

For these reasons it is impossible in many cases for the clinician to arrive at an accurate diagnosis without additional in-

[1] Read by title at the Twenty-ninth Annual Meeting of the Radiological Society of North America, Chicago, Ill., Dec. 1–2, 1943.

formation. The radiologist should be of considerable aid, in that he may suggest the probable etiological agent so that cultures and microscopic studies may be made of material from the lesions. In addition, skin and blood agglutination tests may be of value. In general, the diagnosis of fungus infection should depend upon the finding of the fungus in material from the lesion and the absence of other organisms that could be responsible for it.

Fungi are often secondary invaders in cases of bronchiectasis and other chronic lesions of the lung. The improvement noted in certain cases of bronchiectasis following iodide therapy may be due in part to clearing of the secondary fungus infection.

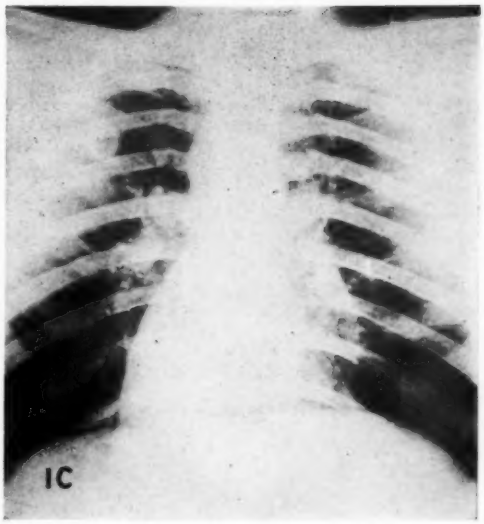

Fig. 1C. Coccidioidomycosis: Local exudative infiltration, left upper lobe, with cavitation.

COCCIDIOIDOMYCOSIS

Twenty-four cases of coccidioidomycosis were diagnosed and confirmed by culture of the causative agent, *Coccidioides immitis*, from the sputum or by positive skin or agglutination tests on the blood. The latter were performed by Smith (1). Four of these patients had additional lesions involving bones. One died of a miliary infection.

The roentgen evidence of pulmonary disease found in these cases varied considerably. The most frequent lesion was a solitary nodose area of infiltration that later broke down leaving a thin-walled cavity. Such lesions ranged in size from those which were barely visible to some several centimeters in diameter (Fig. 1). At times the nodose lesions were scattered throughout the lung so that they gave the appearance of metastatic carcinoma. In other instances, they resembled very closely lesions due to tuberculosis, involving one or both apices or the mid-lung field (Fig. 2). Two cases showed both parenchymal and pleural involvement (Fig. 3). Approximately half of the patients showed slight enlargement of the hilar lymph nodes adjacent to the lung infiltrate.

These cases were observed over periods varying from two months to one year. During this time, the infiltrative lesions cleared slowly, with only slight if any change in the size of most of the cavities present. The histories given by the patients were indefinite. All were from stations in the southwestern United States, chiefly California. Several gave a history of an influenza-like fever that was undoubtedly "valley fever" (2). There was little clinical evidence of disease in the greater number at the time of hospitalization.

Carter (3) described a higher proportion of diffuse infiltrative lesions in relation to the number of cases examined than seen in the small series reported in this paper. Winn and Johnson (4) demonstrated the presence of residual bronchiectasis as well as cyst-like cavities resulting from coccidioidomycosis. The latter were demonstrable in the cases observed here. Lipiodol studies were not made to detect the presence of bronchiectasis, but a number of these patients would undoubtedly show bronchial dilatations.

Aronson and his associates (5) studied a group of persons showing areas of lung fibrosis with associated calcified nodules who gave positive coccidioidin skin tests

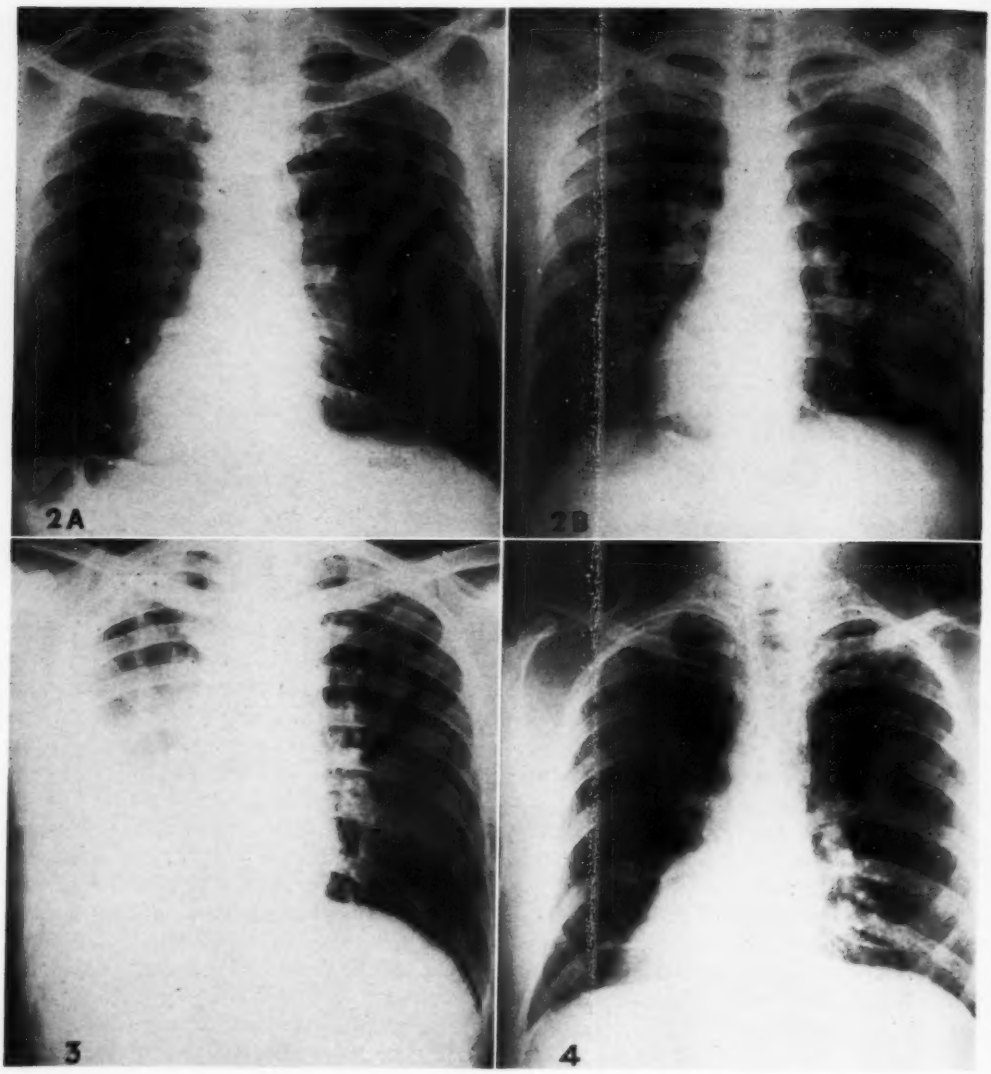

Fig. 2. Coccidioidomycosis: A. Irregular exudative infiltration with fibrosis in each upper lobe and two thin-walled cavities in left upper lobe. B. Irregular nodose exudative infiltration opposite right mid-hilum area. No cavitation.

Fig. 3. Coccidioidomycosis: Pleural fluid and enlarged hilar lymph nodes. Supraclavicular nodes were also present.

Fig. 4. Coccidioidomycosis: Linear fibrosis with multiple small areas of calcification, right upper lobe. The tuberculin skin test was negative, the coccidioidin skin test positive. There was no history of an illness.

and negative tuberculin skin tests. It was assumed that the parenchymal scar was due to coccidioidomycosis. A similar case is shown here (Fig. 4). This patient, a native of the San Joaquin Valley, gave no history of an illness.

ACTINOMYCOSIS

Kirklin and Hefke (6) classify actinomycotic lesions of the chest in four groups: pulmonary, pleuro-pulmonary, pleural, and thoracic.

A well known peculiarity of actinomy-

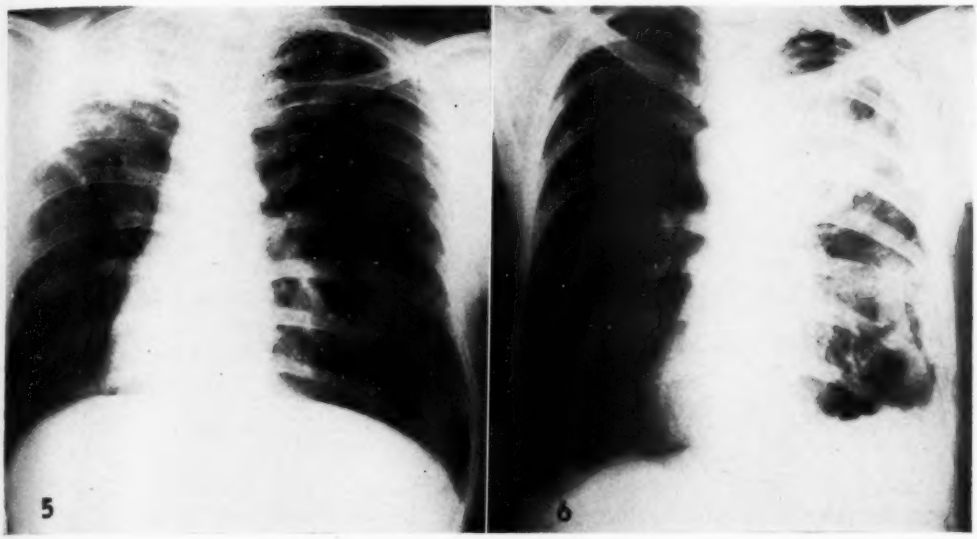

Fig. 5. Actinomycosis: Fairly uniform exudative infiltration, with some fibrosis in the left upper lung, with pleural thickening. A lesion later developed in the right lower lung. This was followed by a liver abscess due to penetration of the diaphragm.

Fig. 6. Actinomycosis: Uniform exudative infiltration opposite right upper hilum. Postoperative drainage of pleural space. Patient recovered following sulfadiazine therapy.

cotic lesions is that the process extends directly from the primary focus with no regard to fascial planes. Hence, there is early extension from the lung into the pleura. The degree of pleural involvement may then obscure the underlying lung lesions on the x-ray film.

Several cases of actinomycosis were seen. Nine of these showed lesions in the lung on roentgen examination. In all there was early or late pleural involvement and in no case was a rib invaded. The lungs showed infiltration which was chronic in appearance and could not be differentiated from tuberculosis (Fig. 5). One or both lungs were involved. As a rule, early abscess formation was present, often being obscured by the pleural lesion.

In those cases coming to autopsy, there was always extensive pleural and lung involvement and the lesion usually extended through the diaphragm to involve the abdominal viscera. In one case of pleural and lung involvement (Fig. 6) the lesion cleared rapidly after sulfadiazine therapy. Patients with minimal lesions of the pleura and no visible parenchymal involvement likewise responded well to this drug in association with drainage of the pleural space.

ASPERGILLOSIS

The group of cases classified as Aspergillus infections of the lungs presented similar radiographic findings. Only a few were actually proved to be due to the fungus. All, however, responded favorably to iodide therapy and therefore are grouped together.

In these patients x-rays revealed a soft, irregular, peribronchial or parenchymal infiltration. The areas tended to be discrete and scattered throughout the lungs. Often there was an associated enlargement of the hilar lymph nodes. The lesions were in most instances first detected on a routine study, with little or no clinical history of illness. Three cases, followed over a period of several months, showed little change until iodide therapy was instituted. Rapid clearing was then noted in each instance (Fig. 7). In another patient observed during the past year, no therapy other than rest was given; yet the infil-

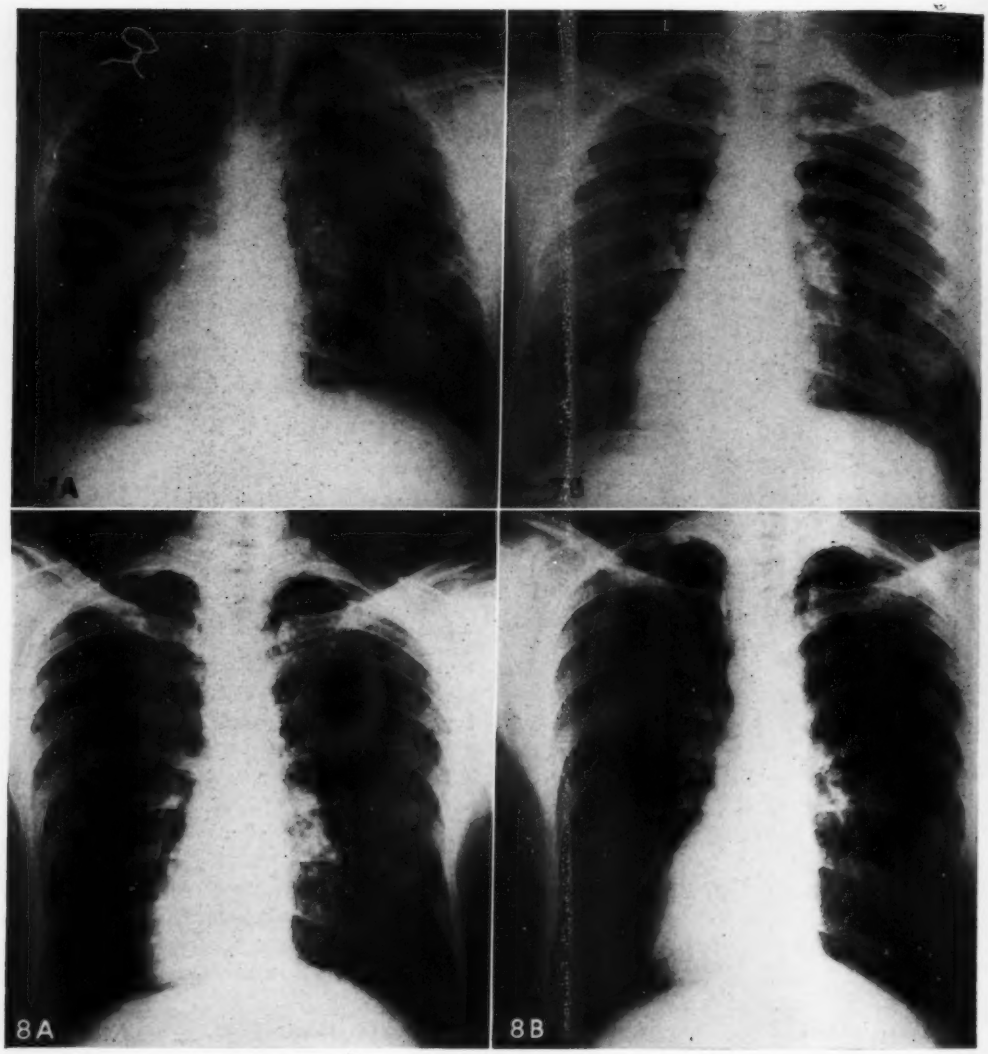

Fig. 7. Aspergillosis: A. Areas of exudative infiltration in each lung field, with enlarged hilar lymph nodes. B. Same case four weeks after institution of iodide therapy. Three months later the lesion had entirely cleared.
Fig. 8. Aspergillosis (diagnosis not confirmed): A. Extensive peribronchial exudative infiltration, bilateral and fairly symmetrical in the two lungs; areas fairly discrete. B. Same case after ten months' observation, showing noticeable clearing.

tration cleared, leaving only a slight residual reaction at the end of twelve months (Fig. 8).

In this type of case, if repeated sputum tests for tubercle bacilli are negative, one may be justified in suggesting iodide therapy and basing the final diagnosis on the response to the treatment. Fawcitt (7) gives an excellent discussion of this and similar fungus infections in England.

Many roentgenograms have been examined in which multiple irregular areas of calcification are seen in the lung parenchyma and in the hilar lymph nodes. These cases may or may not have a negative tuberculin test. This type of calci-

fication is regarded as the residual of a healed fungus infection (Fig. 9).

MONILIA ALBICANS

Monilia albicans is a fungus commonly harbored by man and frequently a secondary invader in pulmonary disease. It also has the distinction of occasionally producing primary lung lesions. Four such instances have been observed in this study.

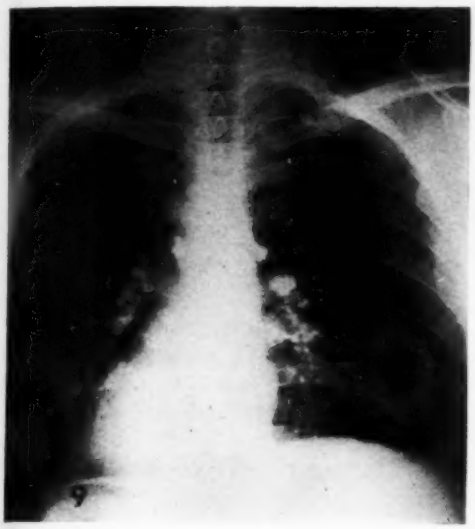

Fig. 9. Extensive calcification in each lung. Tuberculin skin test was negative. No history of illness.

The lesion as demonstrated by x-ray was primarily a diffuse peribronchial infiltration, bilateral and fairly symmetrical on the two sides. One case showed a bilateral apical exudative infiltration with similar infiltration opposite the right mid-hilum area. This later resolved and broke down with resultant cavity formation (Fig. 10). If treated, the lesion resolves rapidly, with residual fibrosis.

TORULOSIS AND BLASTOMYCOSIS

Torulosis and blastomycosis are rare in man. They usually produce parenchymal lesions similar to those seen in tuberculosis. Cases have been reported in which extensive infiltration was present (Carter, 8).

One case of blastomycosis was observed over a period of six years, in which there were small infiltrative lesions in the upper lung field diagnosed as tuberculosis despite repeated negative sputum tests for tubercle bacilli. The patient died of a miliary spread which at autopsy was found to be caused by the fungus. A case of torula infection was also observed. This showed infiltration in the right mid-lung with pleural involvement (Fig. 11). The patient recovered following therapy and drainage of the pleural fluid.

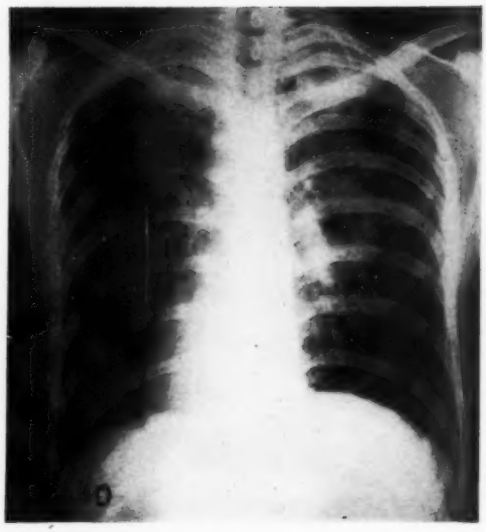

Fig. 10. Moniliasis: Exudative infiltration in each apex and opposite right upper hilum, with cavitation. Lesions healed rapidly, with residual fibrosis.

DISCUSSION

Fungus infections of the lungs are not common. When they do occur, it is important that an early diagnosis be made before extensive damage occurs, as many of the lesions will respond rapidly to therapy.

A wide variety of lesions, as seen by x-ray, may be produced. Many, however, show a somewhat similar picture, which if familiar to the radiologist will lend speed to the diagnosis and subsequent treatment.

The final diagnosis must rest in most

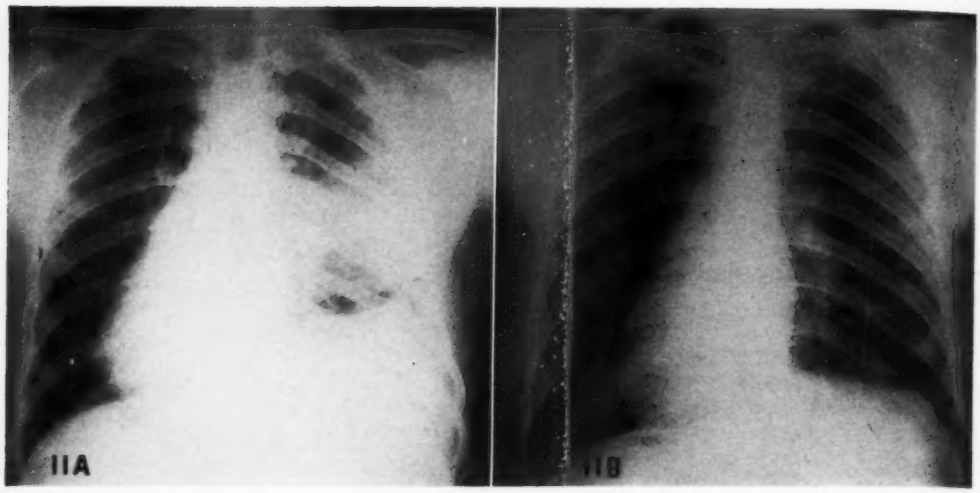

Fig. 11. Torula infection: A. Exudative infiltration, right mid-lung field, with associated pleural reaction. B. Same case following complete clinical recovery.

cases on the isolation of the causative fungus as well as the absence of other etiological factors. The lesions most often resemble a tuberculous infection. Any lesion having the appearance of tuberculosis in which no tubercle bacilli can be found should be studied carefully to rule out a fungus infection. In patients in whom no definite organisms can be isolated, a therapeutic test with iodides may be instituted and the final diagnosis based on the response.

It is probable that many of us will see our first cases of fungus infection due to Coccidioides as men are returned from Army camps. It is important that these lesions be recognized and that the patient be not required to abandon his occupation in every instance, since the course tends to be benign.

SUMMARY

A brief presentation has been made, with discussion, of observations in cases of fungus infections due to Coccidioides, Actinomyces, Aspergillus, Monilia albicans, Torula, and Blastomyces. There is no specific criterion for diagnosis on the basis of a single roentgen study. The lesions in a given type of fungus infection, however, do have a similarity, and the radiologist can be extremely helpful if he will familiarize himself with the findings so that he can suggest the probable diagnosis.

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Roentgen Therapy of Sinusitis, with Special Adapter[1]

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ROENTGEN THERAPY has assumed an increasingly important position in the treatment of sinusitis and its varied associated complications. Far too many cases of so-called head cold are given minor consideration, though the majority of these lasting more than a few days probably result in acute sinusitis. In many instances healing is never complete, and mild exposures, fatigue, and upsets of the acid-base balance reactivate the dormant infection, producing a so-called fresh or new head cold.

While sinusitis knows no age limit, it is well to remember that the antra are the only air sinuses which are more than rudiments at birth (Keith, 1). Some of the other sinuses begin to form at that time. The sphenoidal and ethmoidal groups continue to grow until the twenty-fifth or thirtieth year. Piersol (2) states that the frontal sinuses develop about the seventh year. One need not look for frontal sinusitis, therefore, before the age of seven. All of the sinuses undergo active development during puberty.

As to types of sinusitis, the classification outlined and followed by Hodges and Snead (3) and Firor and Waters (4) seems logical.

Rhinological examinations are of paramount importance in determining the indications for treatment. Patients with anatomical malformations, such as severely deflected septum, malformations of the turbinates interfering with sinus drainage, tumors including polyps, empyema, antral abscesses of dental origin, etc., should not be given x-ray treatment except in conjunction with other proper rhinological procedures. Empyema of the antra requires surgical drainage.

The etiology of sinusitis has received but meager consideration in recent radiologic literature. Inasmuch as cases requiring x-ray treatment are usually of the subacute and chronic hyperplastic variety and such chronicity is admittedly a sequence to repeated colds and acute sinusitis, more stress ought perhaps to be placed upon the investigation of the causative factors.

Van Alyea's recent book (5) on *Nasal Sinuses* contains much valuable material, including Jarvis' classification of twelve varieties of the common cold. Van Alyea states that acute sinusitis is due to a continuity from acute rhinitis and that nasal accumulated contents or pus may be forced into the sinuses by *blowing* or *sneezing*. Hitz (6), many years ago, called attention to the pernicious habit of head cold sufferers who attempt to "blow the cold out" by force, thereby forcing the infection into the sinuses or middle ear. We are all familiar with the "ear click" during a suppressed sneeze or "fog-horn" blowing of the nose. Unless patients are taught how to avoid such baneful habits, repeated attacks of sinusitis may follow. Van Alyea quotes Kelley's findings in a study of allergy in 100 patients with asthma. Of these, 89 per cent had sinus infection: antra 82, ethmoids 61, sphenoids 66, frontal sinuses 46 cases. The writer recently had two patients, young women, who had been treated for sinusitis, both having been subjected to minor rhinologic surgical procedures, without relief. Investigation showed the condition to be seasonal in one, who was a summer hayfever victim, while the other was moderately allergic to feather pollen and house dust. Neither patient required x-ray treatment, but instead needed education and prophylactic measures for relief. Ebb's analysis (quoted by Van Alyea) of 495 autopsies in children up to the age of four-

[1] Read by title at the Twenty-ninth Annual Meeting of the Radiological Society of North America, Chicago, Ill., Dec. 1–2, 1943.

teen years, showed purulent sinus infection in 152 cases (30.6 per cent). The antra were most commonly involved. Frequently one sees a child who has been subjected to adenotonsillectomy for repeated head colds without relief of symptoms. Investigation usually reveals sinusitis, often associated with persistent cough. If more than 30 per cent of children who die show the presence of suppurative sinusitis, certainly sinus infection needs more careful consideration.

Symptoms of sinusitis are necessarily varied, depending upon the nature of the infection, the sinuses involved, the reaction of the host, etc. Nasal or choanal discharge, especially if persistent, the dull nasal voice in pansinusitis, the *varied headaches* relative to the sinuses involved, the repeated attacks of rhinitis and their tenacity, the frequently associated cough, are symptoms which, if they refuse to respond to the usually successful treatment, should prompt sinus investigation. Patients who awake in the morning with headache and postural headache sufferers are good subjects for careful sinus study. Too many headaches that cannot be readily explained are labeled "migraine headache" and the patient is given a powerful analgesic and told that he has a hereditary disease for which there is no cure. Several years ago a plasterer, aged thirty-two, consulted me for "migraine headache." The attacks, which came on suddenly, were severe and disabling. Roentgen examination revealed clear sinuses but a badly impacted upper wisdom tooth. Removal of the tooth was advised, and following this the patient suffered no more from his "migraine."

Diagnosis of sinusitis requires a careful rhinological examination. The tell-tale pharyngeal discharge and the nasal discharge are significant. Transillumination, if done properly, is the simplest test for information as to the condition of the sinuses. I am suspicious of the examiner, however, who proceeds to transilluminate a patient without much the same preparation that is needed for fluoroscopic examination. The room must be dark (black) and the operator must allow time for accommodation of his eyes to the darkness. True, one cannot tell whether there is a frontal sinusitis if there is no transillumination; only the x-ray can reveal that. But the cases in which transillumination is successful need no x-ray for diagnosis. X-ray films, of course, are the final criteria. Most roentgenologists take sinus films in the prone position; yet ought not the same precautions be taken for sinus examination as for chest studies? If we want to know whether or not fluid is present in the chest, we obey the laws of hydrostatics and have the patient stand, sit, or turn on the side, to obtain diagnostic films. If more than 30 per cent of children who die suffer purulent infection in the sinuses, as has been mentioned above, more critical x-rays should certainly be taken in sinusitis cases.

The writer has found no records of the use of the fluoroscope in examination of the sinuses. For several years he has used fluoroscopy as a diagnostic procedure where transillumination indicates or shows sinusitis. A brief rehearsal with the patient before examination will shorten the time of the fluoroscopic examination to one or, at the most, two minutes, providing the examiner is properly prepared for darkroom work. Obviously, these examinations are carried out with the patient in an upright position. The usual advantages of fluoroscopy are appreciated here as the head is tilted and turned right and left in all positions. Where any pathologic changes are noted, films are made for detail studies and record, as in chest examination. The examiner must be educated to identify the various sinuses fluoroscopically. He will benefit by fluoroscopic examination of skulls until orientation is attained. The sphenoids are well displayed in the oblique position, through the orbit. Hodges and Snead (3) make a practice of routine sinus x-ray examination of all patients that come in for chest films, and thus find many unsuspected cases of chronic sinusitis.

TREATMENT

Kisch and Salmond (7) made the observation that a patient obtained relief of pain after each of three roentgen diagnostic procedures. They then gave therapeutic doses in a number of cases of chronic sinusitis, with gratifying results in seven. The acute forms of sinusitis should be treated rhinologically and constitutionally. Sulfa drugs are frequently of value. Van Alyea (5) quotes Talia, as well as Leichner and Schmidt, on the use of short-wave therapy in chronic sinusitis; Laszlo found it of more value in acute cases. The writer gives short-wave therapy in both acute and subacute sinusitis—not the septic cases—with satisfactory results in 80 per cent of cases. A wave length of 10 or 25 meters is used. Van Alyea (5) found infra-red rays of value and writes: "Often one treatment provides the impetus which promotes a healing process."

It is with the subacute and chronic hyperplastic varieties of sinusitis that the radiologists are chiefly concerned. The care with which cases for roentgen therapy are selected is a direct index to the percentage of patients relieved or cured. Anatomic deformities, as well as pathologic changes, such as tumors, polyps, empyemas, etc., must have rhinological treatment. Headache is an almost universal complaint of chronic sinusitis sufferers. As suggested above, a headache which is present when the patient awakens from sleep is probably due to sinusitis. The same is true of postural headache. Headache due to eye strain ordinarily develops hours after work has been resumed.

Hodges and Snead (3) reported satisfactory results in the treatment of sinusitis with x-ray. They gave small doses, also, to the bases of the lungs where bronchitis and a chronic cough had resulted from chronic sinusitis. W. L. Ross (8) used multiple small doses, totaling 300 to 420 r, at 110 kv., and obtained clinical relief in a series of 121 cases. Gatewood (9) made a critical study of 22 cases of sinusitis. His analysis, after careful study before and after irradiation, is instructive. Four patients in his group were completely relieved, 8 were symptomatically improved, and 10 showed no clinical or other improvement. (One of this last group submitted to surgery six days after x-ray treatment.)

Williams and Popp (10) report relief from pain in one to six hours in their most favorable cases. They used small doses, 50 to 100 r at low voltage.

Youngs (11) obtained his best results in children: 15 of his patients were between the ages of four and seventeen. Nine of his cases were listed as cured, 3 as improved, 3 as not improved, but a follow-up of one of his failures indicated complete relief of symptoms after one year.

Firor and Waters (4) caution against x-ray treatment in acute sinusitis and in complicated chronic forms with much fibrosis and polyp formation. They urge rhinologic treatment where indicated. In their series of selected cases (subacute and chronic sinusitis, with hyperplasia), 70 per cent were improved or cured. They used small doses at low voltage. McLendon and Rathbone (12) reported on 291 cases of sinusitis in children who were given roentgen treatment, with 83 per cent clinical improvement in 155 cases checked at the end of one year. They conclude their paper with the statement: "Roentgen therapy is a valuable method of treatment in properly selected cases."

Maxfield and Martin (13) express increased enthusiasm for irradiation in certain types of sinusitis, but stress rhinologic treatment when drainage is needed or tumors are present.

R. R. Rathbone (14) quotes Campbell's statement that in 150 cases of mastoiditis there was a coexistent sinusitis. He believes sinusitis is very common in children and refers to Clerf, who is also quoted by Van Alyea (5), as stating that 82 per cent of bilateral bronchiectasis is due to sinusitis. Rathbone does not advocate x-ray treatment in acute sinusitis and cautions against its use in purulent cases. His results in asthmatic children having frequent

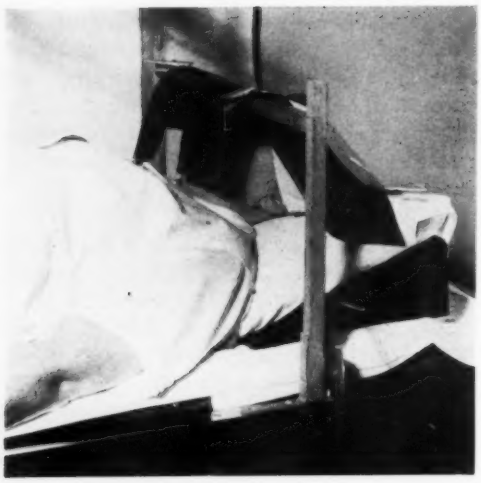


Fig. 1. Old cumbersome method of arranging protective filters for sinus roentgen therapy. The x-ray stand and tube are not shown here.

and repeated colds and complications were exemplary. Some of his cases received high-voltage radiation, 220 kv., well screened, but only 100 r per dose; six treatments were usually given. Of his series of 70 patients followed for three years, 57 per cent were cured, 28 per cent improved, 15 per cent not improved.

Butler and Woolley (15), in their first major report, covering 700 cases of sinusitis treated by x-ray, were able to tabulate the results in 450 cases. Of these, 36 per cent showed complete relief, 55 per cent definite improvement, 9 per cent only slight or no improvement, which is very creditable. These authors emphasize rhinologic treatment of associated disease contributing to sinusitis.

In a later report, covering well over 2,000 treatments, Butler and Woolley (16) pleaded for a more general use of roentgen therapy in suitable cases of chronic sinusitis. They noticed in particular that complaints of headaches, neuritis, and bronchitis ceased after radiotherapy. They continued the use of a single treatment of rather large dosage and reported on a series of cases with high voltage x-rays, 200 kv., heavily filtered. For children smaller doses were used.

In 1942 Butler and Woolley (17) reported on their accumulated experience in roentgen therapy of sinusitis, covering a period of eleven years. They have continued the use of high-voltage roentgen rays with heavier filtration and 50 cm. distance, giving single treatments as recorded in their previous reports. They describe a lead mask for protection of the face, except the areas covering the sinuses. Thirty-three per cent of their cases were cured, 41 per cent improved, 26 per cent unimproved.

Kornblum (18) found a definite relationship between bronchiectasis and sinus disease. He felt that roentgenologists were too conservative and pessimistic about the treatment of the sinuses, especially where surgery is involved.

One sees but few definite instructions as to how to protect the eyes in the roentgen treatment of sinusitis. While it is a well known fact that nerve tissues are radioresistant, one nevertheless ought to take due precautions against any and all unnecessary exposure to radiation of such highly specialized organs as the eyes. Dyke and Davidoff (19) quote Brunner's observations, in 1920, of conjunctivitis and blindness in some of their irradiated animals. They also quote Lyman, Kupalow and Scholz (1933), who found impaired vision in some of their experimental animals. Forsterlings, also quoted by Dyke and Davidoff, concluded (1906) that young animals are particularly susceptible to roentgen radiation and warned against the indiscriminate use of roentgen rays in children.

Not only is the common method of treating each individual sinus, or group of sinuses, through a small cone a time-consuming procedure, but the depth dose is reduced, and the posterior ethmoidal group of cells and the sphenoidal sinuses thus receive inadequate radiation. Some radiologists use three portals of treatment where the sphenoids and posterior ethmoids are involved.

Being impressed by the striking results of roentgen therapy in carbuncle, quinsy, and cellulitis, the writer began roentgen

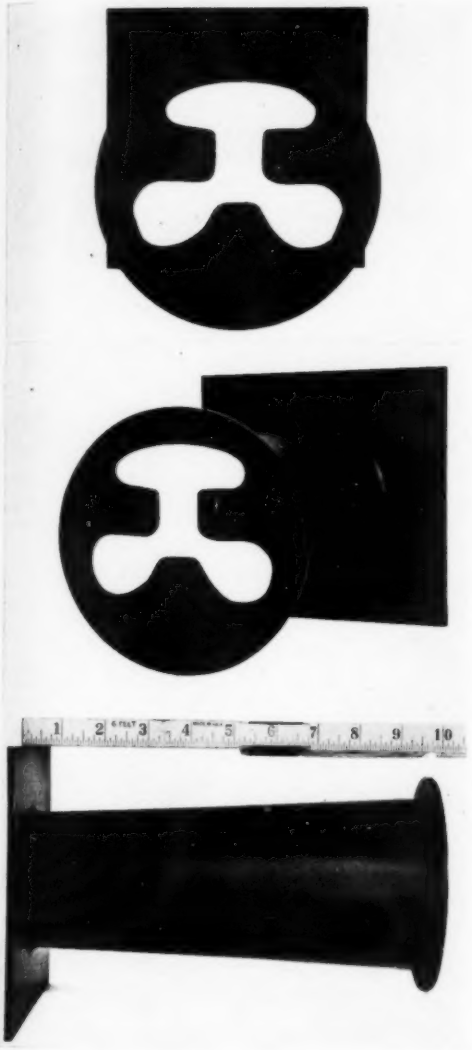


Fig. 2. Treatment cone: end view, three-quarter view, and side view.

irradiation for treatment of chronic sinusitis in 1934. (Having been subjected to puncture drainage and radical antral surgery, in 1920, he knows from personal, as well as professional, experience that radical surgery is not the answer to the problem of sinusitis.) All of the patients treated had complained of severe disabling headache. Rhinological examinations had eliminated or corrected anatomical abnormalities. Inasmuch as other inflammatory conditions

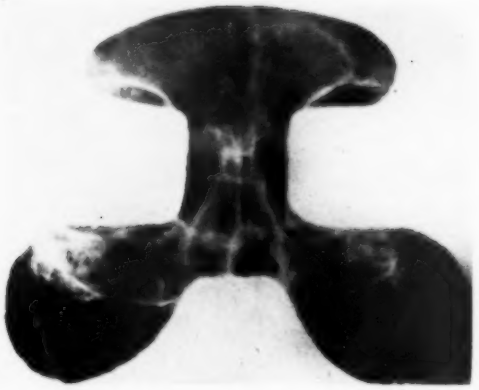
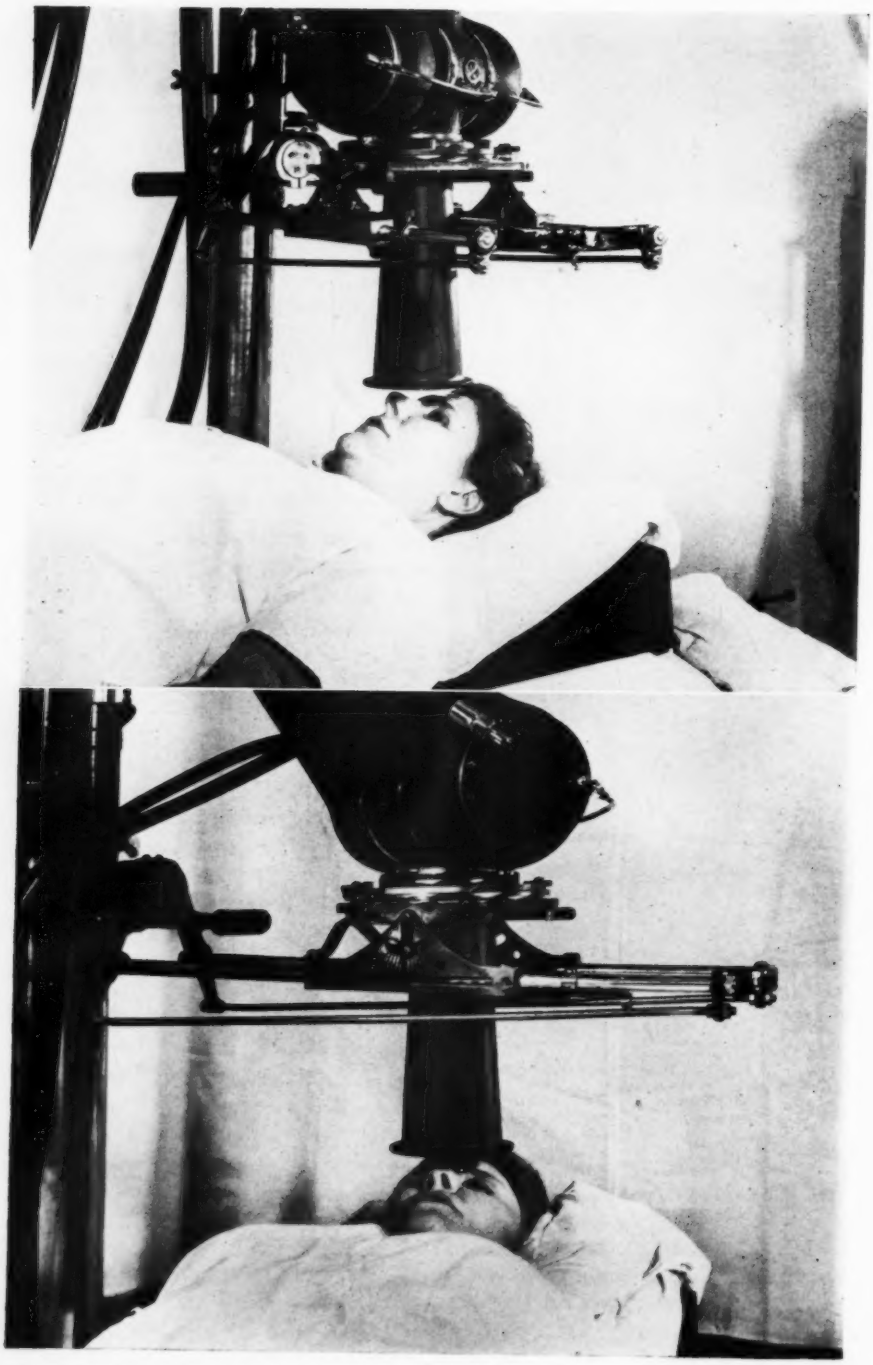


Fig. 3. Field exposed in treating with cone shown in Fig. 2. This is not a diagnostic exposure, being an anteroposterior exposure with cone in treatment position. A 17° inclined plane was used as during treatment.

reacted favorably to small amounts of x-ray (except acute surgical parotitis, where high-voltage treatment is required) small doses were given, through an anterior portal. Each eye was screened with a half dollar placed over gauze and fastened to the temples by adhesive tape. Screening off the rest of the face with leaded rubber sheets, one is constantly confronted with the problem of proper protection and at the same time of keeping the patient comfortable, so that he will not move and upset the whole arrangement (Fig. 1).

In 1939 the writer conceived the idea of placing an adequate and proper filter at the end of a 25-cm. cone so arranged that the eyes are screened and all the sinuses—and only the sinuses—are exposed to radiation at a focal distance of 40 cm. By the use of such a cone (Fig. 2), the time consumed in arranging proper filter for the eyes and eyebrows and screening off the rest of the face is eliminated; there is no weight upon the face, no fear or danger of skin contamination from case to case, no interference with respiration or the patient's comfort. Children do not fear this device. All sinuses are treated, and a better depth dose is obtained than with a small cone (Fig. 3).

Technic: The patient is placed with the head on a 17-degree inclined plane, with



Figs. 4 and 5. A 17° inclined plane is used, and the cone is in position for treatment, at 40 cm. focal distance. In the upper picture the sandbag has been removed from the left side. The lower picture is an end view of the treatment position. The sandbags along the sides of the head help to keep the patient from moving.

a small sand bag on each side to afford a steady position (Figs. 4 and 5). In well developed persons the factors used are: 145 kv., 6 ma., 40 cm. distance, 0.25 mm. Cu plus 1.0 mm. Al, dose 150 r; in lighter persons and children: 120 kv., 6 ma., 40 cm. distance, 0.1 mm. Cu plus 1.0 mm. Al, dose 100 r. The treatment is usually repeated in one week. Some patients have obtained complete clinical relief—*i.e.*, no more headache and lessening or cessation of discharge—from a single treatment. Usually three or four treatments are administered. The patients are instructed how *to cleanse the nose without violent or forceful blowing* (leaving the mouth open and both nostrils free while endeavoring to clear the nose by blowing). Recurrences do take place; roentgen therapy confers no immunity. This is not to be charged, however, to the inefficiency of irradiation, as the condition may recur after any form of treatment, just as it may develop in a person previously well.

With the adapter used by the writer it is a simple problem to block off either or both antra or the frontal sinus area by placing a filter of copper, lead, or silver at the end of the cone over the opening not needed or wanted (Fig. 6).

Of a series of 29 cases of subacute and chronic sinusitis treated by roentgen rays, only 3 cases will be briefly presented, as being of more than ordinary interest: the first 2 from a standpoint of complications present, and the third because of the fact that a single mild treatment gave complete and permanent relief:

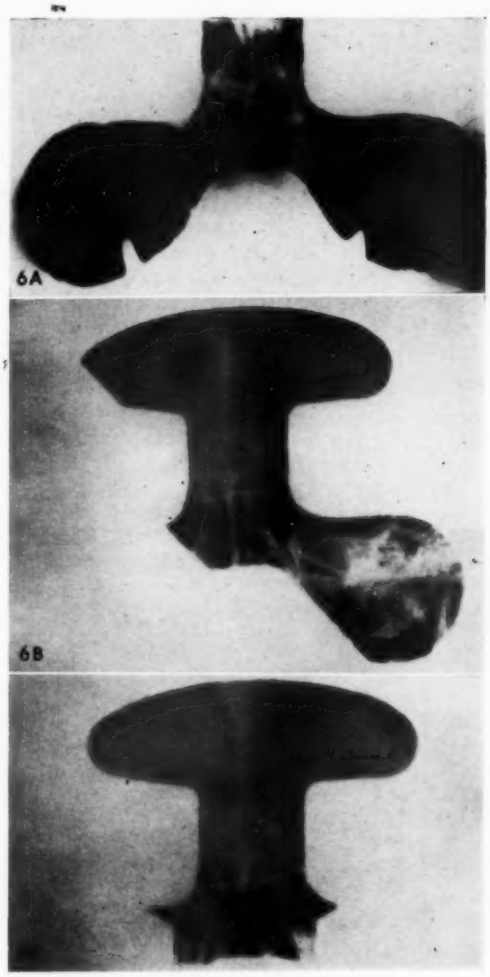


Fig. 6. A. Blocking off of frontal sinuses: ethmoids and antra exposed. B. One antrum blocked off; frontal sinuses, ethmoids, and other antrum exposed. C. Both antra blocked off; frontal sinuses and ethmoids exposed.

Mrs. K. H., age 36, was first seen in August 1941. She complained of chronic nasal and choanal discharge of more than twenty years' duration, productive cough, daily fever of 99 to 100.6°, and frequent morning headaches. Transillumination showed black over all sinuses. Smears from the nasal discharge and sputum showed streptococci. No tubercle bacilli were found in the sputum. Material obtained on several occasions by morning gastric lavage was examined and guinea-pig inoculations were negative for tuberculosis. X-rays showed pansinusitis and pulmonary lesions, mostly in the lower lobes. There was a calcified shadow at the bifurcation of the trachea. Lipiodol instillations and bronchoscopic examination revealed bronchiectasis. The patient was given two x-ray treatments to the sinuses with an interval of one week, followed by short-wave diathermy. General tonic treatment was instituted. Results were gratifying. The cough subsided and the fever disappeared. The antra remain cloudy to transillumination, but the discharge which had been present for twenty years has ceased. In August 1943, two years later, chest films showed marked improvement.

Mr. E. S., age 63, was first seen in May 1940, with almost complete obstruction of the nose by multiple polyps, and constant and profuse choanal drainage. He had severe postural headaches and frequently suffered with morning headaches.

Chronic cough had persisted for many years. Polyps had been removed several times. Rhinologic treatments were again given to clear the nasal passages of polyps. Examination revealed a pansinusitis and a chest film showed a right apical shadow, hilar adenopathy, and some bronchiectasis. Three x-ray treatments were given to the sinuses for a total dose of 450 r at 145 kv., 0.25 mm. Cu plus 1.0 mm. Al filtration, with clinical relief. Two years later there was still marked sinus dullness to transillumination but good aeration; there was no constant nasal discharge, no morning headache. There was no evidence of recurrence of nasal polyps, but recurrence is to be expected where the condition has existed for many years.

Mr. H. K., age 27, presented himself in June 1937, complaining of severe morning and postural headaches following a head cold eight weeks previously, which had never cleared. There were no rhinological abnormalities. Transillumination and x-rays showed black ethmoids and left antrum. The patient was a typical "hard nose-blower." He was given one x-ray treatment of 150 r, at 145 kv., 0.25 mm. Cu. plus 1.0 mm. Al filtration. He was completely relieved by one treatment, and when last seen, in August 1943, he stated that he had had no recurrence of headaches such as he had previously suffered and that he had had only mild colds since learning how *not* to blow his nose.

Of the other 26 patients, 11 were seen two or more years after treatments were administered. All stated that they had been free from the severe type of headache from which they had suffered. Seven patients were followed one year. All had been relieved by the x-ray treatments. Two had suffered recurrences of sinusitis and headache, and the treatments were repeated, producing clinical relief. Of the remaining 10 patients, one, a male aged 65, died of a malignant brain tumor eleven months after his sinus x-ray treatments. The tumor may have been the cause of his headache. Another patient died of pneumonia six months after x-ray treatment. The other 8 have not been followed and therefore cannot be tabulated as relieved, cured, or otherwise. Of the 18 patients followed one or more years, 7 stated that they were relieved of chronic cough. One volunteered the rather colorful statement that he was free from his cough the first morning following his initial x-ray treatment. No case in the series received more than 450 r nor more than four treatments. One case received only a mild treatment of 80 r, single dose. The average number of treatments per case was three.

SUMMARY

1. The etiology of sinusitis is discussed and some of the literature on roentgen therapy is briefly reviewed.

2. Attention is called to the need for hydrostatic observation in sinus film study.

3. Fluoroscopy in sinus diagnosis has definite advantages.

4. A new and safer method for screening eyes and parts of the face, exposing the sinuses only, is described and illustrated. By this method all sinuses can be treated simultaneously, thereby saving time to both the patient and the radiologist.

5. A better depth dose is obtained by using a field which exposes all sinuses simultaneously without the danger of overlapping the exposure fields.

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Relation of Coincident Anomalies of the Gastro-Intestinal Tract and Renal Ptosis to Digestive Disturbance[1]

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STUDY OF A GROUP of patients with duodenal regurgitation revealed that congenital faults of the gastro-intestinal tract and of the urinary tract, and a short first metatarsal in the osseous system, were common. The digestive tract anomalies are seldom of clinical significance but act as signposts directing attention to the upper urinary tract as the reflex cause of the gastro-intestinal symptoms.

Tixier and Clavel (1) showed by animal experimentation that traction on the renal pedicle produced definite reflex motor response in the gastro-intestinal tract. Smith and Orkin (2), inspired by that work, charted the reflex pathways over which such stimuli traveled and gave us the "reno-digestive reflex arc." We thus have the explanation of why abnormal renal mobility and silent lesions of the upper urinary tract may give rise to symptoms in the alimentary tract.

Abnormal renal mobility in women is found almost entirely in those with a short first metatarsal. Feet showing this characteristic are potentially weak and, when overused or fitted with short shoes, give rise to symptoms. Night cramps of the calf muscles are not uncommon, and the adductor longi muscles may be spastic. Study of additional cases since this paper was read shows that, if the pelvic muscles are examined, a spastic piriformis may usually be found, more often unilateral. This latter observation is important, as pressure on or massage of the piriformis may reproduce not only the low backache and supragluteal distress which occurs in so many of these cases but also, in about 20 per cent, will give rise to an indefinite distress or sometimes fairly sharp pain across the lower abdomen, between the navel and the symphysis pubis. Patients will state that this latter symptom is a distress or pain from which they frequently suffer and have attributed to gas. It is not the low right- or left-side pain from an overdistended kidney pelvis. One really puts his finger on the cause and exaggerates this distress if it is present or reproduces it if it is not. Gootnick (3) has discussed the mechanism of night cramps of the legs. Study seems to be indicated here to establish the "trigger mechanism" producing spasticity of the piriformis and sometimes, also, of the coccygeus and levator ani muscles, and to explain the association with abnormal renal mobility and short first metatarsals.

A series of 179 patients (61 males and 118 females) was selected for this study because of the presence of duodenal regurgitation. The age grouping is shown in Table I.

TABLE I: DUODENAL REGURGITATION: AGE INCIDENCE

Age (in years)	Cases
1–10	3
10–20	22
20–30	55
30–40	42
40–50	39
50–60	13
60–70	5

The significance of stasis and regurgitation has been a controversial subject. This is because the behavior patterns of the duodenum have been misunderstood. The close association of the pylorus, duodenum, and gallbladder must be recognized and they must be studied together. Delay in gastric emptying, duodenal regurgitation, gastrospasm and rapid gastric emptying require careful consideration. All of these types of functional response have been observed in this group. Albert Oppenheimer

[1] Presented before the Radiological Society of North America at the Twenty-eighth Annual Meeting, Chicago, Ill., Nov. 30–Dec. 4, 1942.

(4), in his study of duodenal stasis, observed that "in the presence of pylorospasm and of physiologic pyloric contraction, duodenal stasis could be produced by atropine medication, if this caused the pylorus to relax." We have found that duodenal regurgitation follows pylorospasm (or delayed gastric emptying) in a high percentage of cases and no atropine medication is required to produce it. One day pylorospasm may be present and be followed by duodenal regurgitation; the next day reversed duodenal movements may appear promptly without delayed gastric emptying. When the stomach empties rapidly, the phenomenon does not become apparent until half or more of the meal has been evacuated. If the duodenum is short, it may be difficult or entirely impossible to detect regurgitation.

In 1934, a nervous, moderately obese woman came under observation, complaining of spitting up food after every meal. Since this phenomenon has usually been attributed to a reversal of peristalsis, a systematic search of the gastro-intestinal tract was made but failed to reveal any explanation for the trouble. There was neither duodenal stasis nor regurgitation. Further questioning elicited a definite urologic history. Excretion urography showed abnormal right renal mobility. Following an argument with the referring physician as to the advisability of an abdominal support, a compromise was reached in the use of a Rose binder. Complete relief of symptoms followed, and a more permanent device was then prescribed. The patient was followed for several years and there was no relapse. As a result of the improvement in this case, five patients known to have duodenal regurgitation were examined, and all were found to have an abnormal degree of renal mobility. Since that time in the presence of duodenal regurgitation we have examined the urinary tract whenever possible. A gastro-intestinal study has also been made of many patients with frank urinary disease, and reversed duodenal movements have seldom been found. Reflex gastro-intestinal symptoms occur chiefly when the kidney lesion is silent.

The close relation existing between the digestive and urinary tracts, while familiar to some, is certainly not being taken into consideration by the rank and file of the profession. Attention may first be drawn to this relationship in childhood or even infancy. Nausea, vomiting, and low right-side pain may bring the patient to the hospital for appendectomy. Abnormal renal mobility in children causes reflex gastro-intestinal symptoms and associated nutritional deficiencies, with nervousness and altered behavior patterns. This is much more common than the literature indicates. The chief cause of recurrent gastro-intestinal upsets in childhood is to be found in the urinary tract. When such attacks are due to abnormal renal mobility they are relieved spectacularly by an abdominal support. Especially noteworthy is the improvement in the child's disposition. Study of a large group since this paper was originally prepared shows that reversed duodenal movements in the first decade of life are much more common than we had suspected.

The incidence of gastro-intestinal anomalies in our series of patients was impressive. These included anomalies of position of the duodenum, congenital bands and veils, arteriomesenteric compression of the duodenum, incomplete rotation of the midgut, pelvic cecum, low hepatic flexure, low splenic flexure, and redundancy. Frequently there was more than one anomaly, and often as many as five in one patient. These seldom appeared to be of any direct clinical significance.

A routine fairly extensive history was recorded in each case, and the records were compared with Kantor's tabulation of the more important symptoms of 3,000 private patients with digestive disorders (5). His study of 1,754 cases examined roentgenographically showed the incidence of adhesions of the second portion of the duodenum to be 4.8 per cent. He found no comparable figures in the literature, but

TABLE II: COMPARATIVE INCIDENCE OF SYMPTOMS IN DIGESTIVE DISORDERS IN GENERAL AND PATIENTS WITH DUODENAL BANDS (KANTOR) AND IN THE AUTHOR'S SERIES OF DUODENAL REGURGITATION

	General Incidence in 3,000 Patients (Kantor)	Duodenal Bands: 4.8% of 1,754 Patients (Kantor)	Duodenal Regurgitation (Author's series)
Nausea	14%	44%	53%
Headaches	23	44	37
Vomiting	20	41	39
Vertigo	3	20	..
Constipation	46	54	43
Pain (upper abdominal)	28	40	41
Appendicitis (operation)	17	17	36
Appendicitis, (pus, operation)	16	8	...
Cholecystectomy	...	...	13 cases
Nervousness	...	...	50%

"anatomic studies of the bands in this neighborhood, *viz.*, hepatoduodenal, hepatocolic, and hepatoduodenocolic, reveal an incidence of from 15.5 to 30 per cent. Bryant has shown that the hepatocolic ligament is the most frequent congenital adhesion in both sexes and at all ages."

Space does not permit a detailed tabulation of the symptoms occurring with anomalies in various parts of the digestive tract. They are presented here as of the entire group, since we considered them to be of reflex origin. A comparison of Kantor's two groups and our duodenal regurgitation series is given in Table II.

Kantor comments that the chief significance of duodenal veils or bands is their association with a pelvic cecum. In our group a high percentage of patients with a pelvic cecum had, also, abnormal mobility of the right kidney. The renal ptosis explains the symptoms in this group and, since nephroptosis is found frequently in association with lesions in other organs, great care must be exercised that it be not overlooked. This point can be shown by several illustrative groups as follows.

DUODENAL ULCER

Of 119 patients with duodenal ulcer, 36 showed duodenal regurgitation. Urinary tract studies were made in 28 of these—24 males and 4 females—and are included in this discussion. John M. Barnes and Daniel E. Stedem (6), in a report of 80 cases of duodenal stasis, express their belief that the delay in transit through the duodenum bears a causal relationship to ulcer. Andrew C. Ivy (7) writes: "Reverse movements of the duodenum will in all probability be found to be associated with any condition that increases the irritability of the duodenal mucosa or musculature." Our 28 ulcer patients with regurgitation formed only 16 per cent of the 179 cases under discussion. If the concept of Barnes and Stedem is correct, one would have expected the incidence of ulcer to be higher. It is interesting to note that three of the patients had been examined three, four, and five years, respectively, before the ulcers occurred. At that time regurgitation was present but no ulcer. After the ulcers were discovered, no reverse movements were seen.

Coincident renal mobility has been found in all of our ulcer cases with duodenal regurgitation in which an examination of the urinary tract was made. Of 6 consecutive patients previously operated upon, with recurring duodenal ulcers, all had marked right renal mobility.

Nausea alone is uncommon in unobstructed post-pyloric ulcer but is common in renal mobility. Constipation is frequent in ulcer and to it the patient ascribes his trouble. Constipation is frequent, also, in renal ptosis. Hypertension is frequently associated with duodenal ulcer and may be of renal origin. Fatigue, worry, and infection, common with renal ptosis, are said to be underlying causes of duodenal ulcer.

ARTERIOMESENTERIC COMPRESSION

Twelve patients (8 females, 4 males) showed evidence of arteriomesenteric compression. The symptoms were not constant except in one male, who failed to respond to medical and postural treatment. The others were relieved by an abdominal support. The assumption was that the apparent obstruction in these cases was of minor importance, while the duodenal regurgitation was reflex from the kidney

rather than the result of a drag by the colon or the mesentery of the small gut (arteriomesocolic or arteriomesenteric compression).

In the single exceptional case operation was required. This patient was eighteen years of age and had had symptoms since childhood, which were growing constantly worse. He could no longer keep up with his school work. The occlusion was found to be due to a fold of mesentery of the small intestine displaced into the pelvis minor. Renal mobility was not present.

GALLBLADDER DISEASE

Experimental work reviewed by Ivy (7) has shown that reversed duodenal movements cause stasis of bile in the gallbladder. Duodenal regurgitation, an underfunctioning gallbladder, a spastic colon, and renal mobility form a combination of findings frequently observed.

Thirteen patients in this series who had had the gallbladder removed without complete relief of symptoms were found to have a coincident renal ptosis. All but 3 obtained relief from an abdominal support. One of the 3 was relieved by right nephropexy and the other 2 required bilateral kidney fixation. The last patient was interesting in that she experienced relief of hypertensive after fixation of the second kidney. She was evidently of the orthostatic hypertensive type described by W. S. McCann (8). Since not all of our patients with socalled residual symptoms following cholecystectomy showed duodenal regurgitation, the number of cases due to renal ptosis included here is not so large as it would otherwise have been, *i.e.*, 23.

Renal ptosis is common with gallbladder disease. It seems strange that the surgeons have not added renal mobility to the causes of "residual symptoms" following cholecystectomy. Nausea is not a symptom of chronic gallbladder disease unless there be distention of the ducts or the gallbladder. When nausea is present, a lesion of the upper urinary tract should be suspected.

Are the symptoms of the fair, fat, flatulent female of forty of gallbladder or of renal origin?

FLATULENCE AND AEROPHAGIA

Varying degrees of aerophagia and flatulence were present in 40 per cent of this series. The most extreme case was that of a woman of thirty-one brought to the hospital for an acute abdominal condition. She was suffering from an acute aerophagia, with enormous distention of the stomach and small and large intestines. After decompression, a gastro-intestinal study was made and duodenal regurgitation was observed. Excretion urography revealed bilateral third-degree renal ptosis. The exciting cause of the acute episode was the sudden death of a grandmother who lived in the patient's home.

OTHER CONDITIONS

Three patients with gastric carcinoma without pyloric obstruction, in which nausea was an annoying symptom, were shown to have hydronephrosis of moderate degree with marked right renal mobility. One other patient with gastric carcinoma recently examined, without either nausea or duodenal regurgitation, also showed abnormal right renal mobility.

One case of diabetes, with pernicious vomiting, was given a urologic study. A right hydronephrosis with nephroptosis was shown to be present. The patient was relieved when appropriate treatment of the kidney was applied.

A member of our hospital staff, Captain E. E. Erhard, serving with the Air Corps, advises me that air sickness is most common in the group of easy vomiters. The easy vomiters of this series were found to have a pelvic cecum and a low right kidney.

In one Army Hospital, a review of 500 consecutive gastro-intestinal examinations revealed demonstrable organic lesions in only 15 per cent. Since 8 per cent of men have nephroptosis (not the usual 1 or 2 per cent of our textbooks), it seems probable that many members of the armed forces with gastro-intestinal symptoms are

actually suffering from urinary tract abnormalities.

SUMMARY

Duodenal regurgitation is said by some physiologists to be normal and of no clinical significance. We have found it in only 10 per cent of our routine gastro-intestinal studies.

An analysis of the x-ray findings and the histories of 179 patients with duodenal regurgitation has been made. Gastro-intestinal anomalies were present in 80 per cent and significant renal mobility in 72 per cent. The chief factor in the production of reflex gastro-intestinal symptoms is not the degree of renal mobility, but the nervous response to traction on the renal pedicle.

Renal ptosis is common, is frequently coincident with other diseases, and may alter the clinical picture.

The more important extra-urinary symptoms of renal ptosis are disturbances of the digestive tract, such as nausea, vomiting, constipation, flatulence, nervousness, and fatigue. These have been shown to be the chief symptoms in the group discussed.

Duodenal regurgitation has been found most often in association with or reflex from disease of the upper urinary tract. Duodenal regurgitation has become for us an indication for study of the urinary tract also. Some of our best examples of nervous indigestion have been found in this group. These were entirely relieved either by an abdominal support or by placing another scar, not on the belly, but on the back, where it should have been in the first place.

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Diagnosis and Treatment of Osteoclastoma[1]

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DIAGNOSIS

OSTEOCLASTOMA, known also as myeloid sarcoma, myeloma, and giant-cell sarcoma, shows a typical radiographic appearance, usually in the extremity of a bone of a young adult, more commonly in the lower end of the radius, femur, or tibia, or in the upper end of the tibia, though it has been seen at many other sites. As it progresses, the tumour slowly dissolves the bone. It does not infiltrate in the way sarcoma does, consequently the adjacent bone retains its normal characters and its borders show no increased density to indicate reaction. The line of demarcation between tumour and normal bone is often clearly defined. As the former extends, the bony wall beneath the periosteum is gradually dissolved and, when reduced to a sufficient thinness, bulges with the expansion of the tumour. At this stage, but not before, a periosteal reaction in the form of a thin periosteal accretion of new bone may be delineated. Ultimately this bony wall may be completely absorbed. The subarticular bone appears to be more resistant and the articular cartilage is usually still intact when the tumour is first detected. As a result of the decalcification, the stability of the bone is impaired and spontaneous fracture may be the first indication of the presence of the tumour. Disuse or infection may produce additional changes in the radiographic picture.

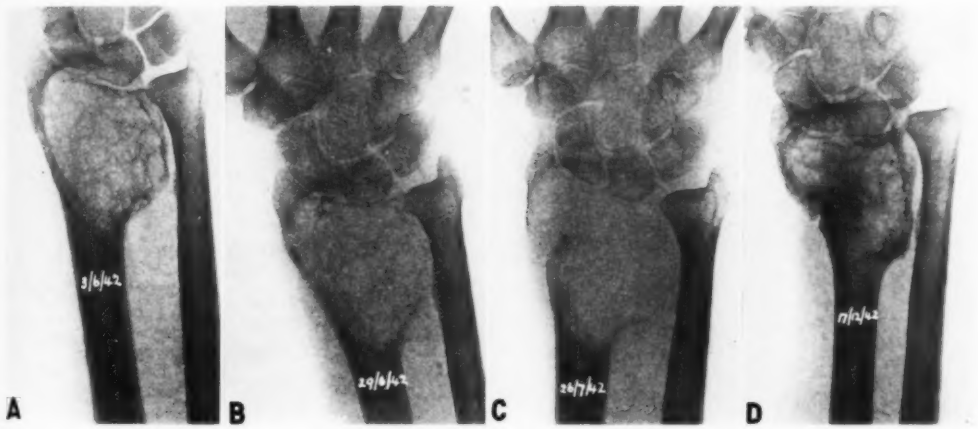

Fig. 1. A. Radiograph showing osteoclastoma at the lower end of the radius (June 3, 1942). B. Radiograph of same case three weeks after roentgen therapy (June 29, 1942). C. Radiograph of same case seven weeks after roentgen therapy (July 26, 1942). Note apparent extension of the tumour and absorption of trabeculae and bony shell. A fracture of the thin shell has occurred. D. Radiograph of same case six months after irradiation (Dec. 17, 1942). Note re-ossification of tumour site. Function now good. The good result has been maintained (November 1943).

There are certain lesions of bone which present radiographic features which may be mistaken for those of this tumour, *e.g.*, multilocular cyst, osteitis fibrosa cystica (simple or due to hyperparathyroidism), chondroma, single lesions of polyostotic fibrous dysplasia, plasmocytoma or solitary myeloma, certain sarcomata, secondary carcinoma, and tuberculosis. The

[1] Read before the Moynihan Club in September 1943. Accepted for publication in December 1943.

characteristic radiographic appearance of these I have described elsewhere (4). My experience is that the typical radiographic picture described above is always associated with the histology of the tumour variously called osteoclastoma, myeloid sarcoma, myeloma, and giant-cell sarcoma. In other words, to the experienced observer the essential histology can be anticipated from the radiographic picture.

2. It weakens the stability of the bone; it may fracture the bone, or damage the joint surface, and make amputation appear essential.

3. It removes the scaffolding on which repair can be built up and so delays restitution.

4. It fails to reveal whether or not the tumour will form metastases. Tumours presenting the same histological structure may be eradicated by local curetting or may metastasize and kill the patient.

5. It may actually disseminate the tumour cells.

6. It is an added risk to the patient.

7. There is evidence which suggests that the surgical trauma may incite malignant metaplasia in some cases.

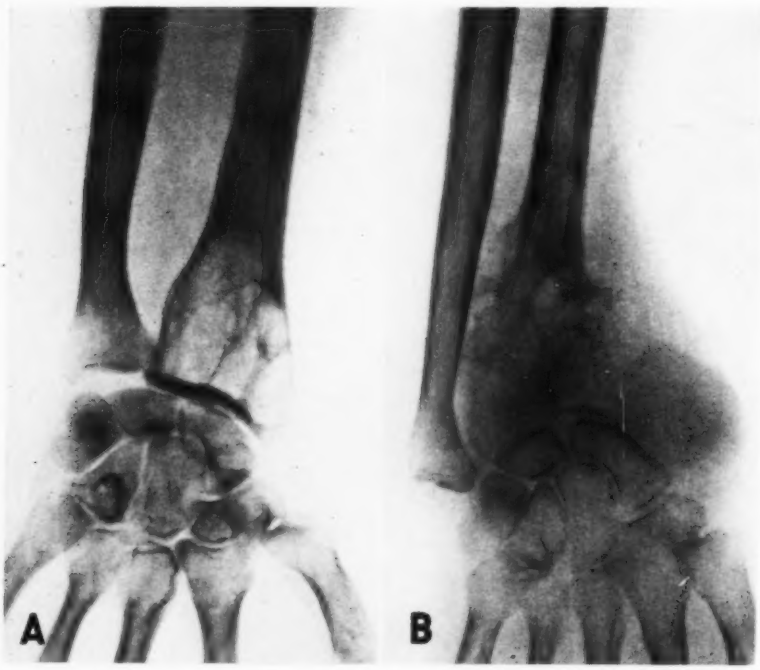

Fig. 2. A. Radiograph showing osteoclastoma at lower end of radius. B. Radiograph of same wrist nine months after curetting.

Faced with the clinical and radiographic evidence of such a tumour in one of the sites mentioned above, the practice being urged today is biopsy of sufficient extent to permit of careful histological examination of all parts of the tumour. Certainly biopsy permits of examination of the histological structure of the tumour but it has important limitations and disadvantages, as follows:

1. It does not reveal any additional features; it merely confirms the radiographic evidence; it may be misleading.

SURGICAL TREATMENT

In those early cases of osteoclastoma in which but a limited section of the bone is involved, localized evacuation of the

tumour cells from the bone followed by carbolization of the walls has been a common procedure. This has been followed by slow consolidation and apparent cure, but I have seen cases in which such a tumour has recurred at the site fifteen to twenty years later and, though amputation was performed, the patient has died from metastases. In some cases in which the local evacuation appeared to be most

ROENTGEN THERAPY

Roentgen therapy first results in an apparent extension of the tumour. Subsequent radiographs, one to three months after irradiation, will show marked increase in the area of osteolysis. Clinically the tumour site becomes much expanded; the skin usually becomes red, glossy, and tight, suggesting increased activity of the tumour. These clinical and radiographic

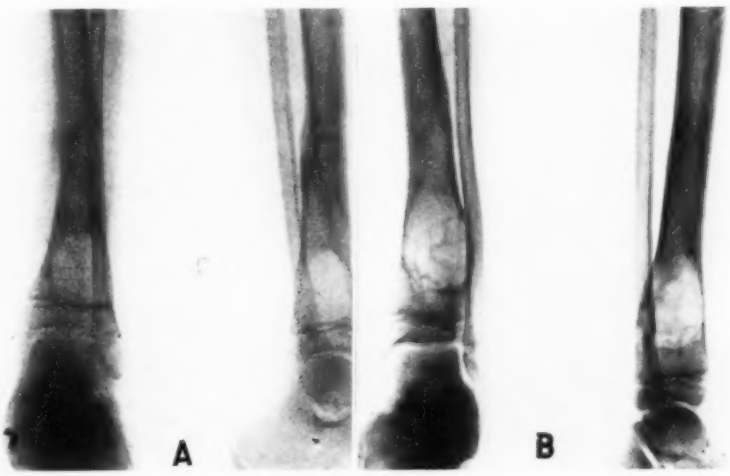

Fig. 3. A. Simple bone cyst in lower end of tibial diaphysis, discovered by radiograph of fracture of shaft. B. Same limb thirty-one months later. Note that the cyst has traveled up the shaft as the result of new bone formation at the metaphysis.

thorough, the tumour has extended so considerably within a few months that amputation has been regarded as essential, but, in spite of this being promptly executed, metastases have developed and death has ensued. Even in the so-called successful case the damage by the surgery seriously impairs the stability of the bone, and fractures or deformities of the joint surfaces are produced, resulting eventually in traumatic arthritis. The removal of so much tissue necessitates a long period of restitution—I have known it to take more than six years for union of fragments to occur. In those cases where the tumour has extensively involved the extremity of a long bone, such as the femur or tibia, amputation has been regarded as the treatment of choice.

features have been regarded as evidence of the activation of tumour cells by radiation and been the cause of many amputations. I was unable to prevent this in a case from which I secured the specimen and had careful histological preparations made. No sign of the typical tumour cells could then be detected; instead degenerate tissue which defined correct interpretation was present. If patience is shown and the case watched for a further period of one or two months, the prominent clinical signs will gradually fade and radiographs will show a progressive reossification of the tumour site. Restoration to normal function may be expected in some sites within the period required for the consolidation of a fracture. With a large area of destruction the time will be

correspondingly increased. The added osteolysis resulting from the radiation must be appreciated and the limb must be immobilized until evidence of re-ossification is obtained, as otherwise fracture may result. Even in those cases in which amputation appears to be the only possible way of preventing invalidism, radiation therapy may lead to consolidation and salvation of the limb.

It may be urged that biopsy is essential because the radiograph is not infallible. My answer is that its infallibility is largely a measure of the extent of the knowledge of radiographic appearances, but in any case it does not seriously matter. There is no simple lesion producing this radiographic appearance which will be improved by biopsy and there is no malignant lesion which will not be the better for the radiation, even if amputation later appears to be desirable. Further, histological interpretation is by no means infallible. The tumours found in the bones in hyperparathyroidism have sometimes identical histological characters, but these respond to enucleation of the parathyroid tumour and have radiographic characters which are entirely distinct. Certain tumours, like that recorded by Matthew Stewart, are throughout white and solid in consistency, quite unlike the prune juice colour of the typical osteoclastoma, have identical histological characters, but cause death by metastases.

For these reasons I advise that the best treatment for osteoclastoma is roentgen therapy and no biopsy, warning the surgeon to expect the clinical and radiographic evidence of apparent extension of the growth and the possibility of pathological fracture during the first three months.

Illustrations of these lesions are included. Others will be found in previous publications (1–4).

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Lung Abscess Secondary to Stenosing Bronchiogenic Carcinoma[1]

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FOR MANY DECADES pulmonary carcinoma has steadily increased in frequency, and the disease is now so common that it is responsible for 10 per cent of all carcinoma deaths (29). At the Charity Hospital of Louisiana it was the cause of more deaths than gastric carcinoma in 1939 and 1940, thereby assuming first place among fatal carcinomas and becoming the most common malignant neoplasm in the male, especially between the ages of forty and sixty-five (16).

In addition to an actual increase in the incidence, there is an apparent increase (4) due in part to "cancer-of-the-lung-mindedness" (27) and to improved roentgenological studies with the aid of penetrating grid films, refined bronchography, and tomography. The all-important bronchoscopic studies with biopsies and the search for an underlying neoplasm in chronic pulmonary and pleural suppurations have also contributed to the greater number of cases, and the knowledge that bronchiogenic carcinoma is a common masquerading (28) and disguising (8) disease is more and more coming to be realized. On the other hand, an actual steady increase is indicated by the observations of competent pathologists and by dependable statistical reports coming from large institutions (34).

As the knowledge of the disease increases, more and more cases are bound to be recognized. Goethe's saying, "what one knows, one sees," is particularly applicable to pulmonary carcinoma (12). Thirty years ago, only 5 per cent of cancers of the lung were correctly diagnosed; now 37 (28) to 50 per cent (1) are recognized before death. Arkin and Wagner believe that the percentage of correct diagnosis could be raised to 90. Two-thirds could be diagnosed from roentgenograms alone. In the remaining third associated pleural and pulmonary changes may render the roentgen diagnosis difficult or impossible.

Pulmonary carcinoma is still frequently unrecognized for two reasons: (1) When the lung tumor remains practically asymptomatic, metastatic lesions in remote parts of the body may simulate a primary neoplasm. In these instances routine chest films may establish or suggest the correct diagnosis. (2) Stenosing bronchiogenic carcinoma, the most common form, is usually masked by secondary infectious processes of the surrounding lung and pleura. In this type a competent bronchoscopist is usually necessary to detect the growth and obtain a biopsy.

An asymptomatic or silent neoplasm of the lung is easily mistaken as secondary when it is small and its remote metastasis is large. In such cases an erroneous diagnosis of carcinoma of the colon, stomach, liver, or pancreas, or some type of abdominal or mediastinal sarcoma is often made. Intrinsic lesions of the gastro-intestinal tract can easily be excluded by roentgenologic studies, in contrast to doubtful primary tumors of the lymph nodes, liver, and soft tissues with or without destruction of adjacent bone. Metastatic lesions in the adrenals, kidneys, and brain may simulate a primary growth to such an extent that an underlying lung tumor is not thought of during life. Also, cardiovascular disturbances, which are practically always present due to circulatory embarrassment and possibly neoplastic invasion of branches of the pulmonary artery and of the mediastinal organs, are frequently the cause of an incorrect

[1] Read by title at the Twenty-ninth Annual Meeting of the Radiological Society of North America, Chicago, Ill., Dec. 1–2, 1943.

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diagnosis. The roentgenologic findings of the chest are not always typical of a primary lung cancer. The lesion may be small or large. When it is single rather than multiple, close to the hilum, and in a male, preferably between the ages of forty and sixty-five, a primary carcinoma may be given serious consideration. Unfortunately, the correct diagnosis is of academic interest only, since at present there is no cure in the advanced metastasizing cases.

The stenosing bronchiogenic neoplasm, on the other hand, may be cured if discovered in an early stage. It is now found more frequently than the peribronchial and parenchymal types (6). It grows slowly and tends to form distant metastases only when far advanced. Histologically, it is a squamous-cell growth (2) and shares a relatively benign nature with the mature epidermoids of the skin and adjacent structures, in contrast to the more malignant adenocarcinoma and small-cell carcinoma developing outside of the bronchi (24). Death is usually due to secondary pulmonary changes and postoperative complications and not to the underlying epidermoid (9).

While the parenchymatous and peribronchial tumor may be readily seen on roentgenograms of the chest, the so-called bronchial (4) or endobronchial (20) growth is usually invisible and masked by pulmonary changes secondary to bronchial stenosis. The bronchial stenosis or obstruction may be either incomplete or complete. With incomplete obstruction, the roentgen appearance depends on the presence or absence of a check-valve mechanism. When this mechanism is present, there is localized obstructive emphysema with spreading of ribs and lowering of the hemidiaphragm. Otherwise, there is diminished aeration of a lobe with retraction of ribs, elevation of the hemidiaphragm, and mediastinal shift to the affected side.

When the obstruction becomes complete, atelectasis will develop in a pulmonary segment, lobe, or entire lung, whereby temporary clearing may be mistaken for resolution in a so-called recurrent or chronic pneumonia. In satellite tumors of the bronchial tree, the obstruction can be complete in one lobe and incomplete in the other, thus causing simultaneously atelectasis of one lobe and obstructive emphysema of the other, as illustrated in the case of Ozlin, Bigger, and Vinson (30).

When the obstruction remains complete, continued secretion on the distal side of the occlusion will cause bronchiectasis (26). Superimposed infection will then become responsible for suppuration, chronic pneumonia, lung abscesses, and pleurisy. As a result of these secondary changes, the tumor may become necrotic to such a degree that it largely disappears and may be recognized only by careful microscopic studies (4).

The knowledge that single or multiple lung abscesses invariably develop (7) distal to a chronically stenosing endobronchial neoplasm is of great importance to the roentgenologist, since, with a prompt diagnosis, radical surgical treatment can be instituted without delay. Otherwise, patients may die from the chronic pulmonary and pleural suppurations, or perhaps from incomplete surgical measures, and not necessarily from the carcinoma.

Unfortunately, the roentgen literature contains but few citations and illustrations of lung abscess distal to a bronchial carcinoma, in contrast to the more frequent discussions in journals devoted to pathology and chest diseases. The following 3 cases which were seen in the City Hospital (New York) within a few days are therefore believed to be of interest.

REPORT OF CASES

CASE 1 (Figs. 1–4): *Squamous-cell carcinoma originating in the right middle lobe bronchus obscured by metastatic pleural tumors and effusion; lung abscess in same location four years previously; chronic cardiac symptoms and clinical impression of carcinoma of sigmoid colon.*

C. P., age 53, white male, laborer, was admitted to City Hospital in October 1942. His complaints were productive cough, dyspnea, night sweats, anorexia, weakness, and muscle pains for two months. One month prior to admission he had a hemoptysis of one teaspoonful of blood. Of special interest

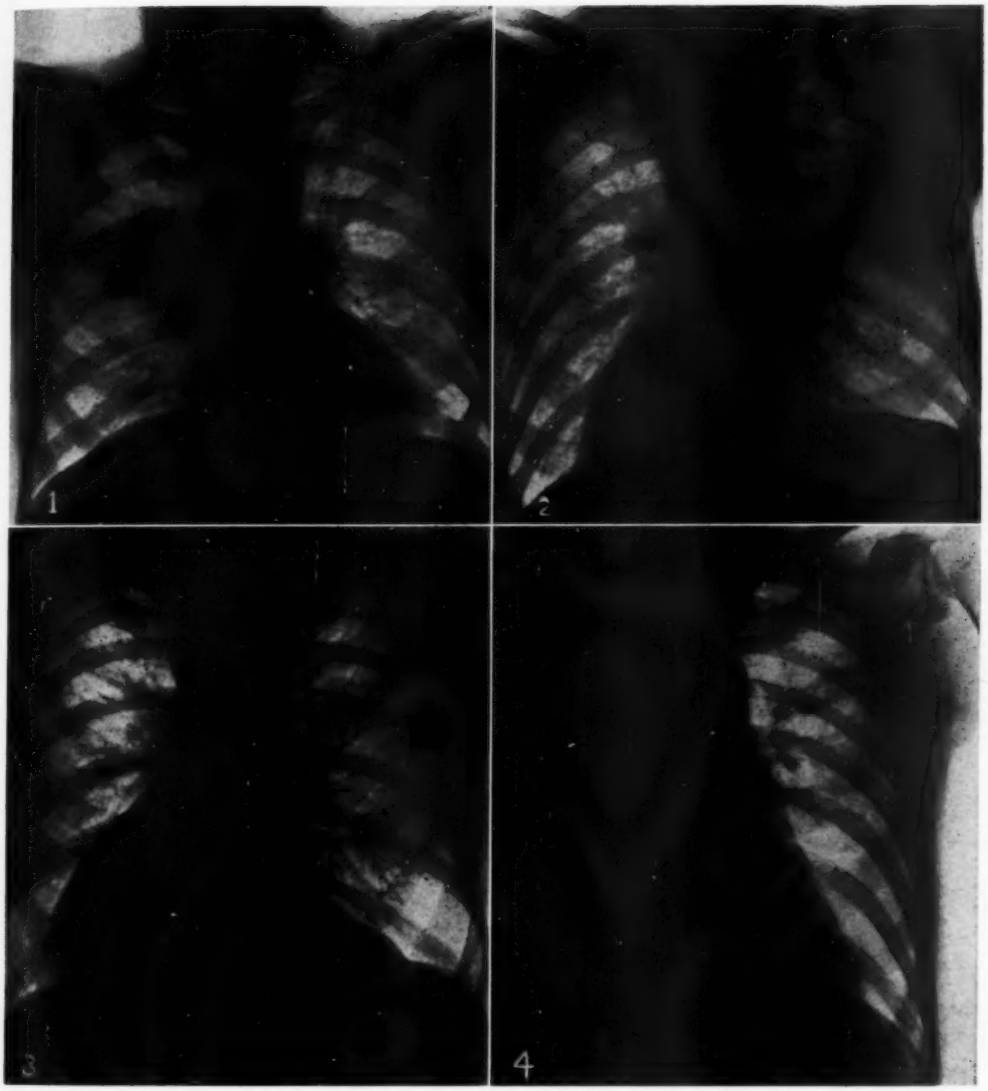

Fig. 1. Case 1: Erect postero-anterior view of the chest in March 1938, showing abscess in right middle lung field with retraction of the right hemithorax.

Fig. 2. Case 1: Supine view of chest made two weeks after Figure 1, showing a more lateral projection of clouding in the right lung above and below the horizontal fissure. A middle lobe involvement is therefore suspected, but no lateral view is available for confirmation.

Fig. 3. Case 1, thirty months later, October 1940. The roentgenogram now shows pulmonary scarring and thickening of the adjacent horizontal fissure in the right middle lung field at the site of the healed lung abscess. Elevation of the right hemidiaphragm with tenting of its dome and again moderate retraction of the right hemithorax suggest diminished aeration and the possibility of underlying bronchostenosis.

Fig. 4. Case 1: Supine view of the chest taken shortly before death, in November 1942, showing marked pleural thickening and effusion in the right chest with obliteration of all details. Osteolytic lesions are seen in the neck of the scapula and in the fifth and ninth left ribs. The clinical impression was primary carcinoma of the colon. Autopsy revealed squamous-cell carcinoma originating in the right middle lobe bronchus with distant metastases.

in this case are the following abstracts of former hospital records:

In 1937, bismuth therapy was given for cerebrospinal syphilis and was followed by signs of toxic hepatitis and dermatitis. X-ray studies of the chest and of the intestinal tract at that time revealed no organic lesion. Early in 1938 a pulmonary consolidation developed in the right middle lung field, which could finally be diagnosed as lung abscess in March 1938 (Figs. 1 and 2). This process became fibrotic two months later, and localized pulmonary scarring was recorded in October 1940 (Fig. 3). The patient was also under medical care for cardiac disorder.

Physical examination at the time of the last admission (October 1942) revealed signs of consolidation in the right lung and a hard movable mass in the left lower abdomen. There was a slight fever, 100° F., and a respiratory rate of 36. The clinical impression was carcinoma of the sigmoid colon and possibly metastatic lesions in the right lung. A chest film taken Nov. 4, 1942, showed an opacity occupying the lower three-fourths of the right lung, fading toward the apex. The underlying lung and hemidiaphragm were completely obliterated. Lack of hyperexpansion of the right hemithorax suggested predominantly pleural thickening and only moderate pleural effusion (Fig. 4). There was no evidence of metastatic lesions in the lungs, but osteolytic processes were observed in the neck of the left scapula and in the fifth and ninth left ribs.

A thoracentesis on the right side produced 350 c.c. of bloody fluid. Soon afterward the patient lapsed into a coma and died on the fourteenth hospital day.

Postmortem examination (Dr. J. R. Lisa) revealed squamous-cell carcinoma originating in the right middle lobe bronchus with extensive suppurative and neoplastic infiltration of the lung. Of special interest were extensive metastatic tumors in the right visceral and parietal pleura, which were so thick as to simulate a primary pleural growth. There were also metastatic tumors in the tracheobronchial lymph nodes, pulmonary artery, right renal vein, adrenals, liver, and skull.

Comment: Squamous-cell carcinoma is known to grow and spread slowly, and the presence of distant metastatic lesions in this case suggests that the growth had existed for a long time. It is reasonable, therefore, to assume that the lung abscess discovered four years prior to death in the same region was the result of a stenosing neoplastic process. Of interest, also, is the tumor invasion of the pulmonary artery, which may partly explain the cardiac disturbance.

CASE 2 (Fig. 5): *Squamous-cell carcinoma of left upper lobe bronchus with abscesses in surrounding lung and marginal empyema simulating cardiac disorder.*

J. P., age 53, white male, elevator operator and formerly a clerk, was admitted to City Hospital with a diagnosis of cerebrospinal syphilis in October 1942. In 1908 he had a chancre, for which he was treated at Bellevue Hospital. In May 1942 he noticed instability of his left leg and went to the Welfare Island Dispensary, where a diagnosis was made of taboparesis with ataxia and Argyll Robertson pupils. He was told there, also, that he had heart disease, for which he was digitalized in June 1942.

After two days on the Dermatological Service of Dr. J. J. Eller, the patient was transferred to the Neurological Service of Dr. J. H. Nolan. There he experienced pain in the left chest, with productive cough and a fever of 103° F. Three weeks after admission, he was referred (Nov. 13, 1942) for x-ray examination, with the tentative diagnosis of left upper lobe pneumonia.

A routine chest film showed an opacity occupying the left upper lobe with an oblique ovoid area of lessened density, 8 × 4 cm., above the hilar region and a similar round area, 2 cm. in diameter, further laterally. The left hemithorax was somewhat expanded in the upper one-half and retracted in the lower one-half. There were also a shift of the heart and mediastinum to the left side and elevation of of the left diaphragm, with tenting of its dome. The right lung was normal. A penetrating grid film, taken subsequently, showed a large ovoid cavity and a small round cavity in the left upper lobe. The left upper lobe bronchus appeared dilated, in high position, curved in an upward direction, and seemed to lead into the large cavity. There was also a marginal empyema in the left upper chest (Fig. 5).

Bronchoscopy was advised to rule out an underlying neoplastic lesion of the left stem bronchus. This was done on Dec. 5, 1943. Tumor tissue was found, a specimen was removed for biopsy, and the histological diagnosis (Doctor Lisa) was squamous-cell carcinoma.

The patient had febrile episodes with temperature up to 104° F. for five weeks. His course was downhill and he was transferred to the Medical Service of Dr. W. L. Whittemore on Dec. 18, 1942. Four days later a marked gas distention of the colon developed, for which an exploratory laparotomy was done on the Surgical Service of Dr. L. W. Crossman. Only adhesions were found in the region of the sigmoid colon. Death occurred four days after operation.

Postmortem examination (Doctor Lisa) revealed a bronchiogenic squamous-cell carcinoma of the left upper lobe bronchus, with extension to the mediastinal nodes and cavities in the left upper lobe distal to the growth, which were surrounded by a mar-

ginal encapsulated empyema. There was also intestinal obstruction due to multiple bands of adhesions in the small intestines and the sigmoid colon.

Comment: Cardiac symptoms, which are frequently encountered in bronchiogenic carcinoma, masked the pulmonary neoplasm and the surrounding lung abscesses. X-ray examination, shortly before death, suggested the proper diagnosis, which was subsequently confirmed.

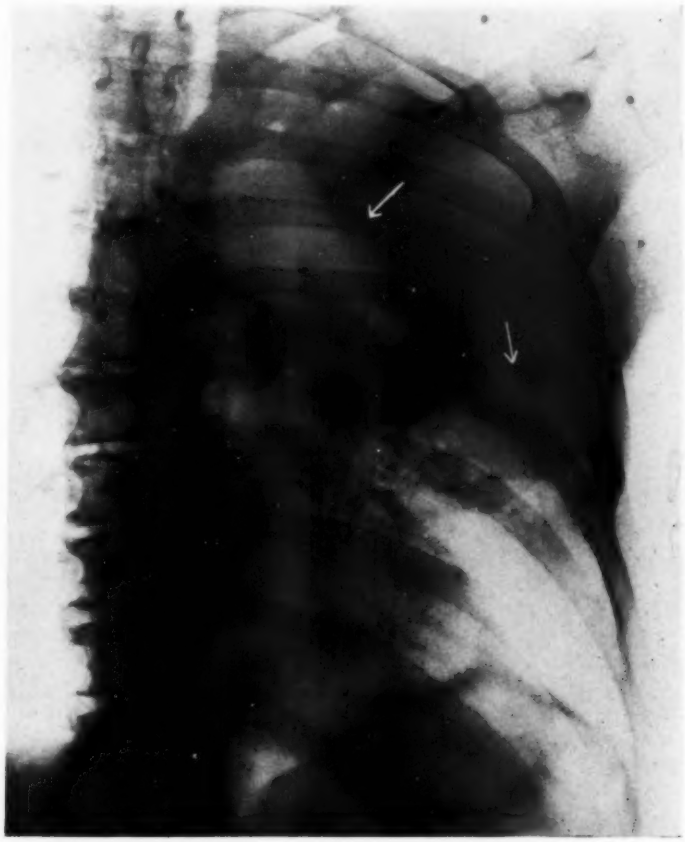

Fig. 5. Case 2: Multiple abscess formations in left upper lobe (arrows) and surrounding empyema. An underlying neoplasm of the left upper lobe bronchus was suspected and confirmed by bronchoscopy and necropsy. This, like Case I, is a case of squamous-cell carcinoma.

CASE 3 (Fig. 6): *Squamous-cell carcinoma of the left upper lobe bronchus with abscess of surrounding lung, simulating tumor of stomach and liver with pulmonary metastasis.*

J. D., age 52, white male, coal shoveler, was admitted to City Hospital on Nov. 11, 1942, with a history of weakness, and swelling of the abdomen and ankles for two weeks. He also complained of shortness of breath and jaundice. Previously he was apparently in good health for more than fifteen years.

Physical examination revealed ascites, enlargement of the liver, and masses in the upper abdomen. The blood pressure was recorded as 220/130 mm. and later as 160/100 mm. There was dullness of the left upper chest and fine crackling râles were heard over the same area. The clinical impression was hypertension and primary abdominal disease, possibly carcinoma of the stomach. Cirrhosis of the liver, heart failure, and a metastatic lesion in the lung were also considered.

X-ray studies of the gastro-intestinal tract revealed extrinsic lesions, but no organic disease of the stomach or intestines. A supine view of the chest showed consolidation in the lower parts of the left upper lobe and areas of lessened density in the apex

and first anterior interspace which suggested abscess formations (Fig. 6).

The patient became increasingly confused and icteric. A paracentesis yielded 2,000 c.c. of hemorrhagic ascitic fluid. The temperature rose to 104° F., and death occurred nine days after admission.

Postmortem examination (Doctor Lisa) revealed a bronchiogenic carcinoma of the left upper lobe with a large abscess of the surrounding lung, large metastatic tumors in the liver and hepatic lymph nodes, and an acute bronchopneumonia in the right lower lobe.

Comment: This case, as well as Case 1, shows that metastatic lesions in distal organs are still frequently mistaken for the primary growth, while the pulmonary neoplasm is believed to be metastatic. Since the abdominal masses were not due to an intrinsic gastro-intestinal tumor, the presence of a lung abscess could have suggested a primary bronchial growth. Unfortunately, the patient was seen only in the terminal phase, when he was too ill for proper x-ray studies.

DISCUSSION

The 3 reported cases of pulmonary carcinoma occurred in males at the ages of fifty-two and fifty-three, which compares with the reported average age of fifty-one (2) and fifty-five (28) for lung cancer in males. It is of interest that the disease is found four (19) to ten (35) times more frequently in males and that the average age in females is approximately forty-three. Only Harbitz (17), in Norway, found an almost equal distribution in the two sexes. Statistical data of the City Hospital material since 1920 are now being prepared and will be published later.

In addition to the reported cases, there were a few observations of homogeneous densities distal to hilar carcinoma which could not be recognized as abscesses during life because air and fluid levels were absent. Of interest, also, is a case of terminal bronchiogenic carcinoma seen by the writer in 1941, which was previously diagnosed as abscess. This observation may be likened to Case 1, in which an abscess distal to the carcinoma had healed and did not recur before death.

The differentiation of lung abscess from a carcinomatous cavity is rather difficult at times (31). In both conditions the cavities may be either thick- or thin-walled and solitary or multiple. A rapid increase in size, however, suggests a neoplastic excavation (32, 33), while regressive changes and healing denote an inflammatory condition. Kirklin and Paterson state that "mottling patchiness and lack of centering suggest abscess", while a homogeneous density and definite centering speak for a malignant growth. Tuberculous cavities can be excluded by repeatedly negative sputum tests, and echinococcus cysts differ by showing a smooth wall without infiltration of the surrounding lung and no bronchostenosis.

The roentgen literature contains only a few discussions and illustrations of the masquerading lung abscesses. There is a comprehensive article on the subject by Golden (13) and recently a case in Hauser and Wolpaw's series of "cavitary bronchogenic carcinoma" (18). In the foreign literature the condition was described by Goldstein (14), Lenk (25), and Bernard and Even (3). Davidson (8) stated in 1930 that abscess may be the first manifestation of a growth which is the real underlying cause of the patient's condition.

Lung abscess develops as a rule secondary to various types of consolidation, to aspiration of foreign material and bronchial obstruction, and less frequently following embolism and spread of suppuration from adjacent structures. The common causes are pneumonia and infarcts (5), anesthesia and operations, especially on tonsils, teeth, jaw bones and neck (11), and such miscellaneous conditions (36) as streptothricosis, actinomycosis, blastomycosis, and infected dermoid and other congenital and acquired cysts. Occasionally, amebic abscess originating in the liver, subphrenic and perirenal abscess, or ulceration of esophageal carcinoma with rupture into the lung is responsible for pulmonary suppuration (15). When all these conditions can be excluded, underlying bronchial carcinoma must be considered, inasmuch as it

causes 10 per cent of all lung abscesses (15, 22). Diagnostic bronchoscopy, therefore, is indicated in all abscess cases with doubtful etiology, especially in males over forty years of age.

Koletsky (24) claims that, in 9 distal abscess cases of a series of 100 autopsies, the growth could have been detected bronchoscopically during life but was missed.

Fig. 6. Case 3: Supine view of chest shortly before death, showing areas of lessened density in left apex and first anterior interspace suggestive of abscess formations. Underlying squamous-cell carcinoma of the left upper lobe bronchus was found at autopsy. The clinical impression was gastric or hepatic carcinoma and possibly metastatic lesions in the left lung.

Jaffé (21) found lung abscess or gangrene 12 times (12 per cent) distal to the tumor and in 3 cases the clinical diagnosis was lung abscess. In 74 postmortem examinations Arkin and Wagner (1) found abscess or gangrene in 20 per cent; other associated lung changes were pleural effusion in 47 per cent, bronchiectasis in 43 per cent, acute pneumonia in 28 per cent, chronic pneumonia in 20 per cent, and purulent bronchitis in 19 per cent.

Bronchial carcinoma with secondary suppuration is usually of the squamous-cell type. This type is more common and less malignant than the peribronchial and parenchymal adenocarcinoma and small-cell carcinoma. The epidermoid or squamous-cell growth progresses slowly and spreads beyond the regional nodes infrequently, secondary pulmonary suppurations usually causing death prior to the development of distant metastatic foci (9). Arkin and Wagner reported one case with complete absence of metastatic lesions at autopsy, and Koletsky observed involvement of lymph nodes beyond the regional nodes in only 24 of 36 cases (66 per cent)

and extrathoracic dissemination in only 35 per cent. He believes that the hyparterial bronchus of the left lung is the most favorable location, since tumors here rarely spread beyond the local lymph nodes.

According to the observations of the pathologists, an underlying bronchial neoplasm remains still frequently undiscovered during life when pulmonary suppurations are predominant. It is the writer's impression that a more widespread knowledge of the syndrome among roentgenologists may result in more bronchographic and bronchoscopic investigations and in a higher percentage of correct diagnoses.

SUMMARY AND CONCLUSIONS

1. A steady increase in the incidence of bronchiogenic carcinoma is believed to be due in part to better clinical observations and more refined methods of examination.

2. Pulmonary carcinoma is still frequently unrecognized, for the following reasons: (*a*) When the lung tumor remains silent, metastatic lesions in remote parts of the body may simulate a primary neoplasm. (*b*) Stenosing bronchiogenic carcinoma is usually masked by secondary infectious processes of the surrounding lung and pleura.

3. Three cases of secondary lung abscess are reported in which underlying bronchial carcinoma was discovered at autopsy.

4. Stenosing bronchial carcinoma with secondary lung abscess suggests a squamous-cell or epidermoid growth, which is more common and less malignant than other types, but is frequently overlooked, so that patients may die from the secondary suppurations and not from the cancer itself.

5. Lung abscess may still be an early complication of a long lasting malignant disease which, if promptly recognized, may be found to be curable.

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March Fracture, Including Others Than Those of the Foot[1]

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WITH THE ADVENT of the Second World War there has been a decided increase in the incidence of march fracture. One may expect to encounter this lesion wherever armed forces are on the march or are undergoing extensive physical training. This is particularly true if the troops are recent recruits and if there is a weight-bearing overload due to heavy packs.

As pointed out by Camp and McCullough (7), march fracture is an example of pseudofracture and may occur in a diseased bone or in a bone subjected to excessive strain. In addition to the metatarsal, the bones involved are likely to be the tibia, femur, pelvis, ribs, radius, and ulna; less frequently these fractures may occur in other parts of the skeletal system.

In so far as the foot is concerned, march fracture may be defined as a painful edematous swelling of the forefoot, insidious in onset and associated with an often unsuspected fracture of a metatarsal. Breithaupt (4), a Prussian military surgeon, first called attention to this entity in 1855. He noticed the painful swelling of the feet in soldiers returning from long marches and considered it an inflammatory reaction in the tendon sheaths due to trauma, a condition which he termed "Fussgeschwulst." Pauzat (23), in 1887, called it *pied forcé* and described it as a severe periosteal proliferation. Stechow (32) first demonstrated the true character of the lesion in 1897 by roentgen studies. It was first noticed in civilians by Deutschländer (9), who reported 6 cases in women in 1921. Swart (34) has recently cited a case of fracture of the second metatarsal occurring in the seventh month of pregnancy.

ETIOLOGY

Various theories and factors must be given consideration in connection with the etiology of march fractures. An architectural weakness of the foot definitely predisposes to the lesion; flat feet and poor circulation may also be contributing factors (30). The wearing of ill-fitting shoes seems to be an important point. Jansen (14) and Deutschländer (9) stress spasm of the interosseous muscles. Dodd (10), however, considers spasm as secondary and trauma as primary in importance. We believe that a plausible explanation is the excessive degree of muscle strain that takes place. After the muscles are severely exhausted, there is a period of relaxation which permits additional strain on the bones, eventually resulting in fracture. Brandt (3) states that march fracture is based on the torsion mechanics of the foot whereby there is an acute sinking of a previously well formed foot. He has well described the traumatic feature as "rhythmically repeated sub-threshold mechanical insults" to bone rather than a single traumatic incident. Any occupation requiring long-continued walking or standing may lead to march fracture. The majority of cases, however, occur in fresh troops with a high percentage of rookies who have led a more or less sedentary life. As would be expected, the earlier and more detailed reports of the condition came from the highly militarized nations of Continental Europe. German and Swiss troops seemed to be more susceptible because of the "forced or goose step," in contrast to the more relaxed march of other armies. Momburg, quoted by Straus (33), made

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studies of soldiers with no foot complaints and showed by roentgen studies that silent periosteal proliferations of the second and third metatarsals were common. He felt that the fracture was due to prolonged elastic bending of the bone structure.

PATHOLOGY

Few cases have presented opportunity for histologic study. Straus (33) cites a case of metatarsal fracture with a seven weeks' history in which roentgen studies revealed a globular mass about the shaft and no evidence of a fracture line, although the latter was searched for carefully on good diagnostic roentgenograms. The bone was removed on a mistaken diagnosis of malignant bone tumor. Excerpts of the pathologist's report follow: "Examination of the specimen showed a bulbous enlargement 1.6 cm. long and 1.7 cm. wide at the junction of the middle and distal thirds of the shaft. The soft tissues were firmly adherent to this. The surface was rough, with small, quite irregular elevations about 1 mm. in diameter. It was quite hard but could be dented with the fingernail. There was no point of false motion discovered on the first examination of the metatarsal, and it was only after longitudinal section of the bone that the true character of the lesion became evident. There was a narrow dark line of old hemorrhage and granulation tissue crossing the shaft almost transversely at the level of the bulbous enlargement. This stopped at the inner side and did not involve the cortex . . . . Microscopic sections through the bone showed it to be well developed and partially calcified osseous tissue . . . . "

A similar situation is reported by Dodd (10), in which a radical foot amputation was performed for a suspected neoplasm, which proved, on subsequent pathologic study, to be a march fracture. The importance of bearing in mind march fracture in such instances cannot be overstressed.

CASE STUDIES

This paper is based on 70 cases referred to the Roentgenological Service of Brooke General Hospital from January 1942 to April 1943, comprising 66 involving the metatarsals, 3 the femur, and 1 the oscalcis. The metatarsal cases represent 72 individual fractures, 41 on the right and 31 on the left. As to the specific bone involved, this was the first metatarsal in 1 case, the second in 26 cases, the third in 38, the fourth in 6, and the fifth in 1 case. Multiple fractures in the same foot occurred as follows: Two cases involving the second and third metatarsal and one each the second and fourth, the second and fifth, and the second, third, and fourth.

The proximal portion of the bone was involved in only 6 cases. Forty-eight fractures were located in the mid-shaft and 18 in the distal third. Most of those classified as in the mid-shaft, however, were actually closer to the junction of the middle and distal thirds.

Practically all cases presented varying degrees of periosteal reaction, while only 31 showed definite fracture lines. The greatest amount of callus appeared from one to two months after the onset of symptoms.

The age of the patients varied from twenty to forty-five years, the average being twenty-two. The time interval from the onset of pain to the date of hospitalization was also variable. Approximately 70 per cent were admitted within the first two weeks, and the remainder from two weeks to four months after the onset. The duration of hospital treatment was seldom longer than one month.

Of the 66 men with metatarsal fractures, only 5 were placed on limited duty. Of the remaining 61, 11 received treatment in the out-patient clinic, consisting chiefly of arch supports, proper fitting of shoes, and return to full duty. The other 50 patients were hospitalized, treatment consisting of the application of a plaster walking boot for an average of three weeks, followed by ten to fourteen days of physiotherapy and proper arch supports. All 50 returned to full duty. There were no discharges from the Army for march foot alone.

Fig. 1. Case 1: Roentgenograms made Feb. 12, 1943, twenty-five days after onset of pain, showing oblique fracture line in distal femoral shaft. Note periosteal reaction at fracture margins.

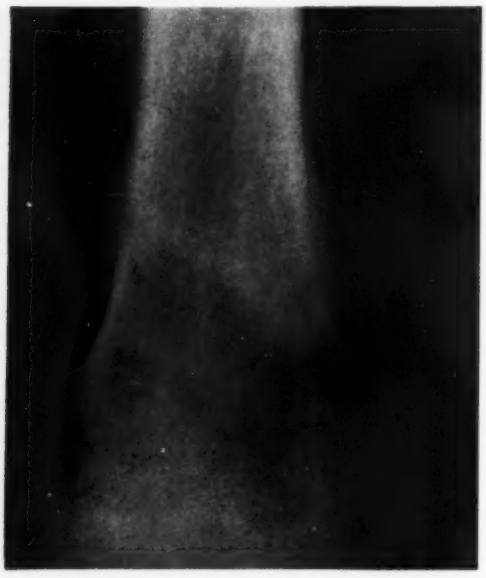


Fig. 2. Case 2: Anteroposterior roentgenogram made on April 2, 1943, forty-three days after onset of pain. Note oblique fracture through distal femoral shaft, left, with an abundance of well formed callus.

All 3 femoral fractures (2 left and 1 right) involved the distal portion of the shaft, with no displacement. One man returned to full duty and 2 were placed on limited duty. The patient with an os calcis fracture was likewise placed on limited duty.

In a well seasoned division of troops only 8 cases of march fracture were recorded during eleven months in 1942. In a less seasoned division, the incidence was much higher, 62 cases being diagnosed roentgenographically in a four-month period from December 1942 to April 1943. The average length of previous service for the men involved was only three months. It is to be emphasized that training during this period was intensive and long hikes were frequently made. When the hikes were shortened and a more rational training schedule was instituted, the incidence of of march fracture dropped abruptly.

COMMENT

It is evident that a diagnosis of march fracture may be made with a fair degree of certainty in many cases on the basis of periosteal proliferation, even in the absence of a fracture line. In diagnosing the early cases one must insist on obtain-

ing the best roentgenograms possible, in the oblique as well as the conventional superior-inferior position. Nevertheless, a certain number of fine linear fractures will escape detection.

Perhaps the most important consideration in differential diagnosis is malignant growth. Given a globular bony mass about a bone shaft, a demonstrable fracture line, and a reliable history of marching, a neoplasm should not be feared. On the basis of the bony mass alone, there seems to be no accurate description of the structures which will definitely substantiate or rule out a diagnosis of tumor. In selected cases a biopsy may be imperative.

Several reports in recent years show a higher incidence in the second than in the third metatarsal. In our limited number of cases the reverse was true, 26 involving the second and 38 the third metatarsal. Stechow's first report of cases showed a higher percentage in the third than in the second.

Terhune and Eddleman (36), in reporting a case of multiple fracture, state they were unable to find similar cases in the literature. Speed and Blake (31) cite a case of march fracture of the second and third metatarsal but state that it is most unusual. Our series includes five cases of multiple fracture. It is reasonable to believe that others will be reported in the near future.

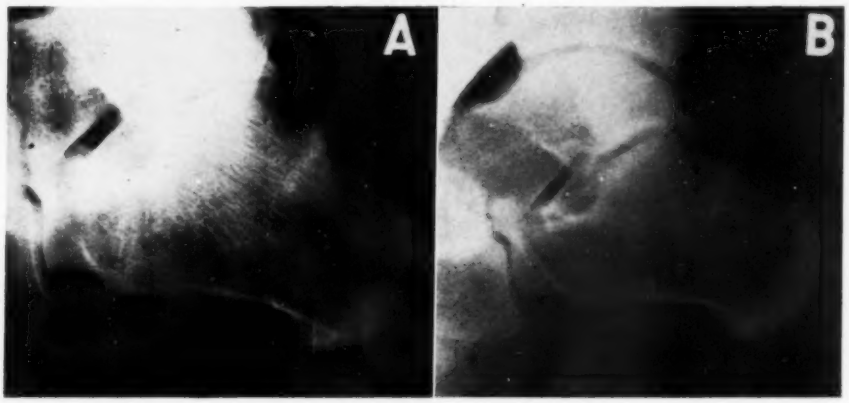


Fig. 3. Case 3: A. Lateral roentgenogram of left calcaneus made on April 9, 1943, showing incomplete fracture, two weeks after onset of symptoms. B. Roentgenogram made on May 17, 1943, fifty-two days after onset. Note callus formation with partial obliteration of fracture line.

CASE REPORTS

CASE 1: H. E. N., private, age 43, was referred for roentgen study Feb. 12, 1943. He stated that about January 18, while on a five-mile hike with a full pack, he stumbled on a rock but did not fall. Ever since that incident he had experienced an aching pain about the left knee and had been put on light duty.

Physical findings consisted of point bone tenderness in the distal left femur just above the medial and lateral condyles.

Roentgenograms revealed a slightly oblique fracture through the distal third of the femoral shaft with early callus and no displacement (Fig. 1). Re-examination on March 3 showed no significant change.

Treatment in this case was chiefly physiotherapy, and the patient remained ambulatory. On April 28, 1943, he was assigned to limited duty.

CASE 2: R. S. P., private first class, age 37, was on a practice speed hike of five miles on Feb. 18, 1943, when he suddenly experienced pain around and above the left knee. He fell down and was unable to get up unassisted. Physical examination revealed the presence of normal knee action. Spasm and tenderness of the quadriceps muscle of moderate degree were observed. Although the pain persisted for several days, the patient was not incapacitated and remained on duty.

On March 4 a roentgen study, made because of continued symptoms, demonstrated a slightly oblique fracture of the distal portion of the left femoral shaft.

The patient remained ambulatory with the assistance of crutches and was given a furlough of four weeks. Re-examination on April 2 revealed a fair

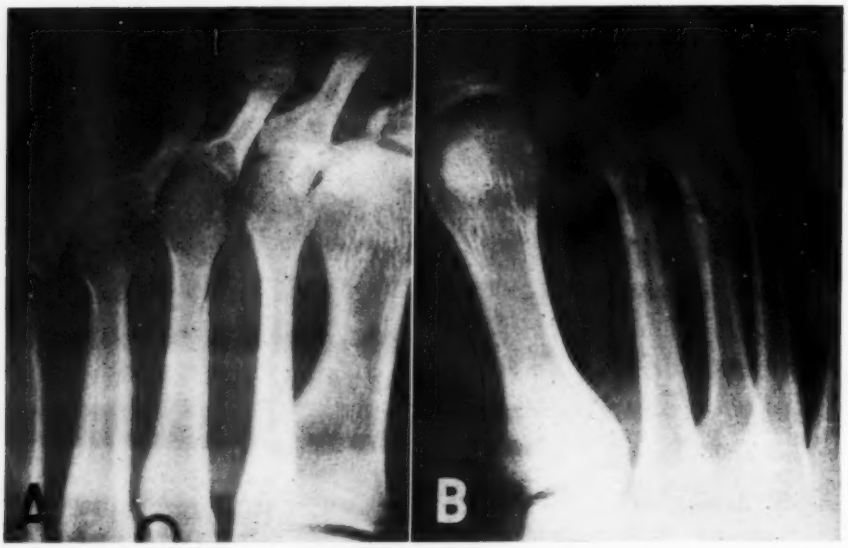
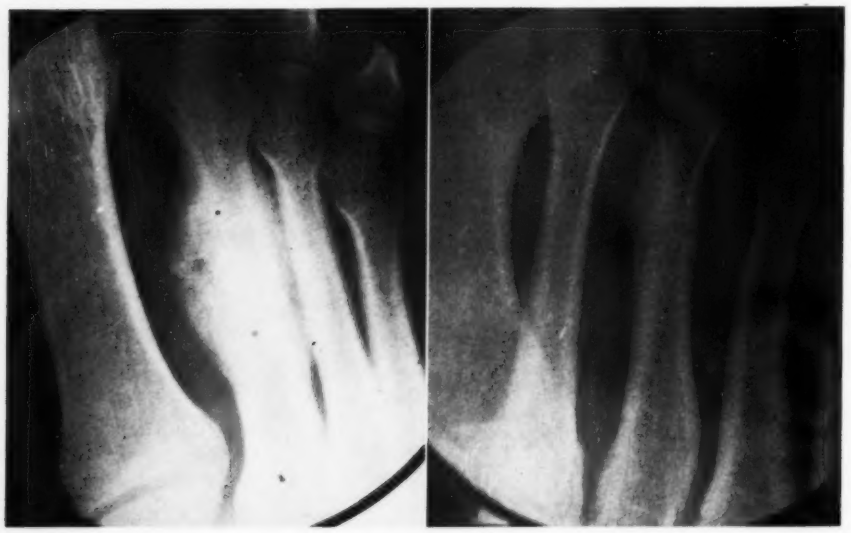


Fig. 4. Case 4: A. Oblique roentgenogram of right forefoot made on Dec. 24, 1942, three days after onset of symptoms. Note complete transverse fracture through distal third of shaft of third metatarsal, without displacement. B. Roentgenogram made on March 2, 1943, ten weeks after onset of symptoms. Note well formed callus about the fracture zone.



Figs. 5 and 6. Cases 5 and 6. Figure 5 (left) is a roentgenogram of right foot (Case 5) made on Feb. 18, 1943, six weeks after onset of symptoms. Note extensive callus formation about fracture in mid-shaft of second metatarsal.

Fig. 6 (right) is a roentgenogram of the left foot (Case 6) made on Jan. 26, 1943, one month after onset of pain. Note extensive periosteal reaction in shaft of third metatarsal.

amount of callus formation about the fracture (Fig. 2). He remained in the hospital receiving physiotherapy and awaiting disposition until May 24, at which time he was assigned to limited duty.

CASE 3: W. J. K., private, age 25, was referred to the Roentgenological Service on April 9, 1943, with a diagnosis of sprain of the left foot. He stated that his left heel began to hurt two weeks previously

and that he had been marching an average of ten miles a day for several weeks. On physical examination there was little evidence of soft-tissue swelling about the heel, although pain was elicited by firm pressure over the bone.

Roentgen study in the lateral and superior-inferior positions revealed an incomplete fracture through the superior portion of the os calcis, slightly posterior to the joint (Fig. 3A). Early callus formation was also observed.

Re-examination on May 17 showed an increase in callus with partial obliteration of the fracture line (Fig. 3B). On June 11 good healing was seen in the roentgenogram, with further obliteration of the fracture line.

A plaster walking boot was applied on April 11 and removed May 18. A sponge rubber arch was given for support. This patient was classified for limited duty on June 2, 1943.

CASE 4: J. E. T., private, age 24, following a five-mile hike on Dec. 21, 1942, noticed a cramping and soreness in the right foot just proximal to the third and fourth toes. The next day he started on a twenty-one-mile hike, whereupon the pain in the foot became more and more severe, forcing him to drop out.

Roentgen study on Dec. 24 revealed a complete transverse fracture through the distal shaft of the third right metatarsal without displacement (Fig. 4A). Moderate localized soft-tissue swelling and tenderness were observed at this time.

On Dec. 28 a plaster walking boot was applied for a period of three weeks. After another three weeks of physiotherapy and arch support the patient returned to full duty. A routine re-examination on March 2, 1943, revealed a moderate amount of well formed callus about the fracture zone (Fig. 4B). At that time the patient was entirely free of symptoms.

CASE 5: F. O. T., private, age 23, was referred to the hospital Feb. 18, 1943, complaining of a gradual onset of pain and swelling in the right forefoot which dated back to a nine-mile hike six weeks earlier. During the interim he had performed his regular duties.

Roentgen study at this time disclosed a fracture through the mid-shaft of the right second metatarsal with associated callus formation (Fig. 5). Swelling and tenderness were confined to the base of this bone.

After routine treatment, consisting in the application of a plaster walking boot, physiotherapy, and arch support, he was returned to full duty on March 16, 1943.

CASE 6: A. L. W., private, age 22, went on a hike of twenty-one miles on Christmas day, 1942. He experienced pain about the ball of the left foot, for which he received physiotherapy. When this gave no relief he was hospitalized, at which time there was moderate tenderness on pressure over the second and third metatarsals, associated with mild soft-tissue swelling.

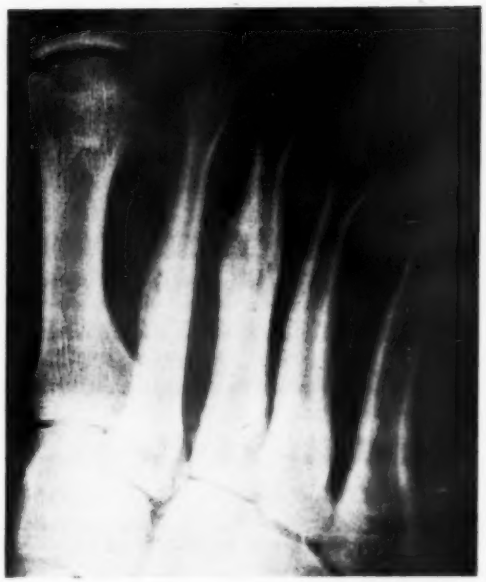


Fig. 7. Case 7: Roentgenogram of left foot made on Jan. 27, 1943, about two months after onset of pain. Note periosteal reaction in second and third metatarsals.

Roentgen examination on Jan. 26, 1943, showed marked callus formation about the distal portion of the shaft of the third metatarsal (Fig. 6).

Treatment consisted chiefly in further physiotherapy and an arch support. On April 8, 1943, the patient was assigned to limited duty.

CASE 7: E. J. K., private, age 21, had pain and swelling in the ball of the left foot early in November 1942. He reported to the dispensary, where he received treatment for athlete's foot. Although he continued his regular duties, the pain persisted from the date of onset. On Jan. 10, 1943, he experienced a worse attack of pain in the same region. On Jan. 27 the first roentgen study was made, showing an old healed fracture of the mid-shaft of the third metatarsal and what appeared to be a more recent fracture of the second metatarsal near the junction of the middle and distal thirds (Fig. 7). Re-examination on Feb. 15 showed no essential change in either bone. A plaster walking boot was worn from Jan. 28 to Feb. 10. Treatment was by physiotherapy until Feb. 27, 1943, at which time the patient was able to resume full duty.

SUMMARY

1. March fracture, although showing a high incidence in the foot, especially the second and third metatarsals, is occasionally encountered in other parts of the skeletal system.

2. This condition should be considered an example of pseudofracture, with or without signs of pre-existing disease.

3. The primary etiological factors are believed to be (*a*) muscular exhaustion, associated with repeated sub-threshold mechanical insults to the osseous system, (*b*) mechanical insufficiency of an otherwise normal bone, and (*c*) physiological inadequacy of bone due to a disease process.

4. The all-important factor in diagnosis is to avoid a mistaken interpretation of malignant bone tumor, leading to amputation or other unnecessary radical therapy.

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The Influence of Irradiation of the Ovaries Upon Estrus and Neoplastic Development in Marsh-Buffalo Mice[1,2]

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EVIDENCE HAS been produced indicating that the Marsh-Buffalo strain of mice is a stumbling block to any attempt to correlate tendency to development of cancer of the mammary gland with the amount of exogenous estrin required to enhance the incidence of this form of cancer in females or to produce it in males (1, 2, 3). Amounts of estrin which enhance formation of breast tumors in other high-cancer strains of mice fail to do so in either males or females of the Marsh-Buffalo strain. The stimulation of endogenous production of estrogens through the gonadotropins has likewise failed to enhance tumor formation of the mammary gland (3, 4). That the tumor is endocrine-linked is, however, well established by the influence of true or of functional castration, and the possibility remains that the production of cancer is the result of an aberration in the hormonal regulation or the production of abnormal hormonal products. In view of the fact that roentgen irradiation of the ovaries, while destroying the follicular mechanism, leaves a residue of interstitial cells capable of liberation of estrogenic substances (not necessarily the same as in the normal mouse) (5, 6, 7, 8, 9, 10), it seemed well worth while to study the effect of such irradiation on the development of breast cancer in the Marsh-Buffalo strain.

EXPERIMENTAL STUDIES

Two groups of 40 mice each of the Marsh-Buffalo strain were segregated for irradiation of the ovaries; equal numbers of litter mates served as controls. Irradiation was performed after vaginal canalization was established, the latter process usually occurring the sixth week of life. One group of mice received 200 r, the other group 400 r, measured with back-scattering, all at a H.V.L. of 1.15 mm. Cu. Dosage was controlled by a Victoreen Integron III. The lower dose is the one recommended by Geist *et al.* (11) in their studies on irradiation of the ovaries of mice. These authors shielded the head of the mouse with lead, irradiating the trunk. For the purposes of our experiments, we found it necessary to shield the mammary gland arcs and the greater part of the uterus. This was accomplished by taping the mouse to a lead plate which contained a port exposing the area surrounding the ovaries. Five rectangular openings were cut in a lead plate 1.5 mm. thick. Four of these, 1 × 3 cm. each, were equidistant from a central opening measuring 2.2 × 1.5 cm. The distance of the peripheral ports from the central was 4.5 cm. center to center. The mice were strapped over the four peripheral openings with adhesive tape, and the plate, with the mice beneath, was supported under the tube with the central opening in the center of the beam of radiation. The thimble chamber of the Integron was then placed beneath the central opening. Previous tests with a Victoreen condenser r meter placed under the peripheral ports in the same relative position as the mice showed that the quantity of radiation, including back-scattering from the lead, was essentially the same beneath all five ports. It may, therefore, be assumed that each mouse received the dose for which the Integron was set.

Vaginal smears on both the irradiated and control mice were taken at suitable intervals throughout the course of the experiment, the spatula method being used. Smears were taken daily for a six-day

[1] From the Departments of Chemistry and of Radiology and Cancer, Santa Barbara Cottage Hospital Research Institute, Santa Barbara, Calif. Read by title at the Twenty-ninth Annual Meeting of the Radiological Society of North America, Chicago, Ill., Dec. 1–2, 1943.

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TABLE I: INFLUENCE OF 200 R IRRADIATION OF THE OVARIES ON THE INCIDENCE (PERCENTAGE OF TIME) OF THE PRESENCE OF CORNIFIED EPITHELIAL CELLS IN THE VAGINAL SMEAR

Age of Mice in Months	Per Cent Incidence of Cornified Cells		
	Controls	Irradiated Mice	Irradiated Mice Developing Tumors
1.5	33	8	8
2.0	33	21	24
4.0	..	50	48
6.0	20	36	36
8.0	37	24	20
10.0	25	34	32

None of the controls developed continuous estrus. Five of the irradiated mice developed continuous estrus.

TABLE II: INFLUENCE OF 400 R IRRADIATION OF THE OVARIES ON THE INCIDENCE (PERCENTAGE OF TIME) OF THE PRESENCE OF CORNIFIED EPITHELIAL CELLS IN THE VAGINAL SMEAR

Age of Mice in Months	Per Cent Incidence of Cornified Cells	
	Controls	Irradiated Mice
1.5	40 ± 1	0
3.5	25 ± 1	20 ± 1
5.0	27 ± 1	15 ± 1
13.5	33 ± 6	15 ± 4

period, and the results of these examinations are given in Tables I and II.

The recording, examination, and analysis of the tumor data followed the routine procedures in use in this laboratory (3).

RESULTS

The incidence of cornified epithelial cells in the vaginal smears of the controls 20 to 40 per cent of the time is normal for the mouse and confirms the data of others. It will be noted that 200 r irradiation reduced this figure markedly and 400 r abolished estrus entirely in the period immediately following irradiation. In the mice which received the higher dose, the extent of estrus established for the controls was never attained throughout a thirteen-month period. The lower dose, however produced an increase in estrus the fourth month, followed by a six-month period in which the mean estrus did not deviate markedly from that of the controls. There were, however, 5 irradiated mice which developed a continuous estrus. This phenomenon was never observed in any of the controls. At the seventeenth month of age in the series which had received 200 r irradiation, 7 of the controls and 7 of the irradiated mice had been removed from the experiment through causes not related to carcinoma formation. These included death due to pneumonia and the development of lymphoid tumors. Since these mice and the age of occurrence of the disturbing phenomena were equally distributed between controls and irradiated mice, they need not be considered in the analysis of the tumor data. The cumulative incidence of development of carcinoma in this series is given in Table III. In one of the controls an adenocarcinoma of the parotid developed. In all other cases the characteristic Marsh-Buffalo adenocarcinoma of the breast was observed. It will be noted that at the fifteenth month of age the cumulative incidence of 62 per cent for the irradiated mice *versus* 39 per cent for the controls reveals a significant difference (2 times the standard deviation of the mean, 2.3 times if the parotid tumor is eliminated).

TABLE III: CUMULATIVE INCIDENCE OF ADENOCARCINOMA IN CONTROL AND IRRADIATED (OVARIAN) MARSH-BUFFALO MICE

Age in Months	Control (39 Mice)	200 r Irradiation (39 Mice)	Control (37 Mice)	400 r Irradiation (39 Mice)
7	3	3	3	0
8	8	3	5	8
9	13	18	8	8
10	20	31	14	10
11	31	38	22	23
12	33	43	32	23
13	39	54	43	33
14	39	59	46	41
15	39	62	49	43
16	41	62	51	45
17	50	65	54	48

In the experiment concerned with the higher irradiation dose, 5 mice in the control and 7 mice in the experimental group were removed from the experiment for causes not related to breast tumor formation. The data in Table III for cumulative incidence of breast tumor formation reveal at no time any significant difference between the controls and irradiated mice.

During the course of the experiment lymphoid tumors developed in none of the controls; 5 of the irradiated mice had lymphoid tumors.

The systemic effect of irradiation may be gauged, at least in part, by the span of life, the causes of death not related to tumor formation, and the body-weight-growth curve. Causes of death not related to tumor formation were actually less in both irradiated series than they were for the control series, though the differences are probably not significant. The body-weight curves follow:

AVERAGE BODY WEIGHT

	5 Mo.	7 Mo.	9 Mo.	12 Mo.
Control.....	25.4	26.0	27.6	29.4 ± 0.6
X-ray 200 r....	24.0	25.8	26.5	27.4 ± 0.6
	3 Mo.	5 Mo.	13 Mo.	
Control.....	23.1	25.8	28.7	
X-ray 400 r....	21.9	24.7	27.5	

It will be noted that for both series of irradiated mice the body weight curve lags slightly behind that of the controls. The maximum difference, which is less than 7 per cent, is significant.

DISCUSSION

The striking result of the experiment is the observation that by irradiation of the ovaries (200 r) it was possible to produce what it has not been possible to produce by non-toxic doses of estrins or by ovarian stimulation through gonadotropins, *viz.*, an increase in the incidence of adenocarcinoma of the breast. The experiments with hormone administration cannot be regarded as isolated experiments, since they were performed with graded dosage, in large series of animals, and under a variety of conditions (continuous or intermittent effect).

In Table I is recorded the incidence of estrus for the irradiated mice as compared with the incidence for the controls. The incidence is also calculated for those irradiated mice which did not develop tumors. There is no correlation between extent of estrus and tumor development. Moreover, in the experiment in which the mice received 400 r, breast cancer development is not decreased, although estrus is markedly decreased. If estrus is accepted as an objective measure for estrin activity (whether exogenous or endogenous), then it must be concluded that tumor development cannot be correlated with degree of estrin activity in this strain of mice. One is forced to admit the possibility that the irradiated ovary produced an abnormal estrin capable of stimulating carcinogenesis to a greater degree than the stimulation due to the normal ovarian secretion.

It should be noted that while irradiation of the ovaries with 200 r produced a significant increase in incidence of breast tumors, it did not increase the incidence of lymphoid tumors. This is contrary to the experience with estrin dosage, with which lymphoid tumor formation was more readily effected than breast tumor formation. In the experiment with 400 r irradiation, the incidence of lymphoid tumors was increased under conditions in which endogenous estrin formation was decreased. It would therefore appear that the increase in incidence of lymphoid tumors, when it occurs after estrin dosage, is probably a secondary effect and not due to a primary carcinogenic action.

In our experiments the uterus, mammary gland arcs, and head were shielded from irradiation. The adrenals must, however, have received considerable radiation. They cannot be eliminated entirely from consideration in the above discussion.

Attempts to correlate the above experiments with observations made in irradiation of human ovaries are hardly feasible. One should bear in mind, however, that the dose (400 r) which decreased estrus markedly was without influence upon subsequent breast tumor development, indicating that nothing short of complete or lasting functional castration would influence the course of carcinogenesis leading to tumors of the breast; moreover, the stimulating dose (200 r) actually increased carcinogenesis.

SUMMARY

Respective groups of 40 mice each received 200 and 400 r irradiation of the ovaries following the establishment of vaginal canalization. Equal numbers of litter mates served as controls.

Immediately following irradiation, the lower dose reduced estrus markedly, while the higher dose reduced estrus entirely. For the higher dose, the extent of estrus established for the controls was never attained throughout a thirteen-month period. The lower dose produced an increase in estrus the fourth month, followed by a six-month period in which the mean estrus did not deviate markedly from that of the controls.

Two hundred r irradiation of the ovaries increased the incidence of adenocarcinoma of the breast significantly, but did not increase the incidence of lumphoid tumors.

Four hundred r irradiation, while reducing estrus markedly, was without influence upon the cumulative incidence of cancer of the breast, but increased the incidence of lymphoid tumors.

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CASE REPORTS

Esophagocecal Fistula Diagnosed Roentgenologically[1]

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The fact that a careful search of the medical literature failed to disclose any analogous case either diagnosed clinically or demonstrated roentgenologically seems to justify the publication of the following report.

B. G., white female, 45 years old; esophageal stricture from swallowing lye; apparently successful attempts to dilate stricture not followed by general improvement, severe malnutrition; flushing of bowels shortly after feeding; lower right quadrant pain; roentgen demonstration of fistulous tract between perforation of esophagus and cecum; death from peritonitis following gastrostomy; postmortem examination.

A 45-year-old housewife was admitted March 4, 1943, on the medical service of the Colorado General Hospital, complaining of loss of weight and strength and inability to retain food. The pre-admission diagnosis was severe malnutrition due to esophageal stricture. In October 1941, the patient had accidentally swallowed lye, vomiting one hour later. The next day she went to her local physician, who sent her to a hospital, where she stayed two weeks. She had since been more or less continuously under the care of a competent otolaryngologist, who had been attempting to dilate the developing stricture of the esophagus. In spite of an apparently successful dilatation, the patient, to the surprise of her doctor, continued to lose weight. This observation prompted him to send her to the Colorado General Hospital for thorough study. Some weeks before admission she began to experience discomfort in the right lower quadrant of the abdomen and pain in the right loin, both of which were aggravated by walking and by the erect posture. She therefore walked with a distinct limp, stooping a little forward and to the right and favoring the right side.

The patient stated that she did not always regurgitate her food, which had been invariably in liquid form, and she was sure that sometimes it went into her stomach. On infrequent occasions, about twenty minutes after the meal had been apparently successfully taken, she would notice a great activity of the intestinal tract, in her own words "a boiling in her bowels." Within another twenty minutes to half an hour she would have several very loose stools resembling in appearance the liquid meal just consumed.

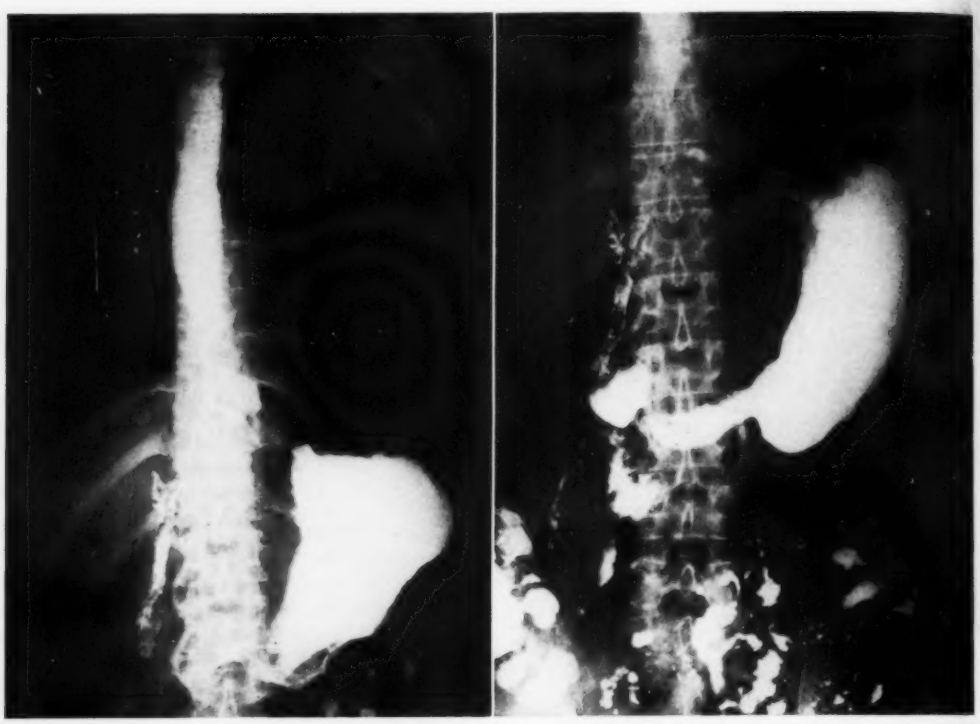
The patient's eyes, ears, mouth, and throat all appeared normal. It is interesting that the usual eye signs and mouth signs of vitamin deficiencies were absent. The tongue was coated, but not smooth, or red, or sore. The lungs were clear (physical examination). The blood pressure was 175/95. The rhythm of the heart was normal and no murmurs were present. The abdominal muscles were rigid, making examination difficult. This rigidity was more marked on the right side, but no obviously tender areas or masses were felt. The spleen and the liver were not palpable; findings on rectal and vaginal examination were normal.

At the time of admission, urinalysis was as follows: specific gravity, 1.020; albumin, trace; no sugar; acetone, 4 plus; otherwise negative. Blood examination on March 2 showed 9.2 gm. hemoglobin; 3,360,000 red cells; 11,000 white cells (polymorphonuclears 67 per cent; lymphocytes 30; endothelials 2; eosinophiles 1). The Wassermann and Eagle tests were negative. An attempt was made to examine the gastric contents. The material aspirated showed no free HCl, but 11 degrees total acidity. The microscopic findings were: pus 4; mucus 2; many gram positive rods suggestive of Boas-Oppler bacilli. Tests for lactic acid and occult blood were negative.

During the first week of hospitalization the patient had a slight elevation of temperature, which ranged between 99 and 101°. During the third and fourth weeks the temperature declined, but her weight, which had gone up to 81 lb., declined to 74 lb.

The first x-ray examination (with the aid of a barium meal) was done on March 11, 1943 (Figs. 1 and 2). It revealed deformity and narrowing of the esophagus at the level of the ninth dorsal vertebra, apparently due to stricture. Part of the barium meal entered the stomach through the lower portion of the esophagus and through the cardia, demonstrating some irregularity of outline and pocket formation in the region of the gastroesophageal junction, probably due to the old injury. A lesser portion of the barium mixture filled a fistulous tract extending from the right of the esophageal stricture in an almost vertical direction through the diaphragm to the right lumbar region, where it subdivided into several branches. There was slight enlargement of upper and middle thirds of the esophagus. No evidence was found of organic lesions in the fundus of the stomach, pylorus, or duodenal bulb. The stomach and duodenum were practically empty after six hours. The gall-

[1] From the Departments of Medicine and Radiology of the University of Colorado School of Medicine and Hospitals, Denver, Col. Accepted for publication in November 1943.



Figs. 1 and 2. Barium visualization of esophageal stricture, of esophagogastric deformity (apparently old lye injury), and of esophagocecal fistula (with branches).

bladder and appendix were not visualized. There was a slight irregularity in filling of the colon, without definite evidence of an organic lesion. The barium-filled intra-abdominal fistulous tracts appeared practically empty in the 24-hour roentgenogram. There was a ligamentous spondylosis of ankylosing type involving the right aspect of the lumbar spine.

Conclusion: Stricture of esophagus; esophageal deformity at gastro-esophageal junction; fistula of esophagus extending through diaphragm into abdomen; ankylosing spondylosis of lumbar spine.

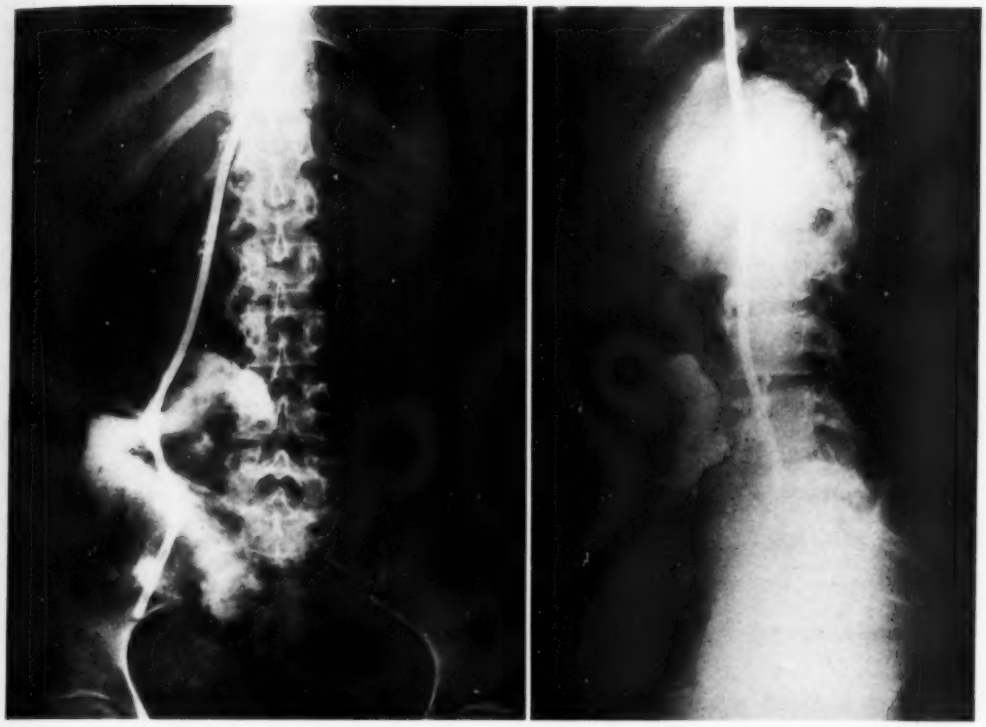
The connection of the esophago-abdominal fistula with the cecum was definitely established by the x-ray examination of April 1, 1943 (Figs. 3 and 4). An esophageal tube was passed through the fistulous tract as far as the cecal region and was injected with a thin barium mixture. This mixture immediately filled the cecum and ascending colon. A subsequent barium enema showed the meeting and merging of the proximal and distal barium columns in the transverse colon. No reflux from the cecum into the fistulous tract was noted in follow-up roentgenograms.

The x-ray examinations of the esophagus and abdomen were unaccompanied by either pain or untoward sequelae.

Roentgenograms of the chest showed prominence of hilar and bronchial markings but revealed no evidence of pathologic changes in heart, lungs, or diaphragm.

On April 7, the patient's 38th hospital day, esophagoscopy was done by Dr. Herman Laff, whose report was as follows: "A moderate amount of undigested food and barium was found in the upper two-thirds of the esophagus. At the opening of the stricture purulent-like material was seen oozing from below. A Jackson bougie was inserted and could be passed beyond the expected region of the cardia, with the conclusion that the bougie was in the retroperitoneal tract rather than in the esophageal lumen. No other opening was seen above the stricture, so that it would appear that the normal lumen of the esophagus branches from the fistulous tract below at the point of the origin of the constriction."

The patient had a moderately severe reaction from this examination, her temperature reaching 102.8° that evening and 104° the next day. She was immediately given sulfathiazole and by the fourth day after the examination the temperature had declined to normal. Sulfathiazole was discontinued ten days after the examination, by which date a total of 45 gm. had been taken. The tem-



Figs. 3 and 4. Barium filling of cecum and ascending colon through esophageal tube (in fistula): anteroposterior and lateral views.

perature remained slightly irregular the last ten days before operation.

During the week following esophagoscopic examination the patient was given intravenous fluids including amino acids, 8 oz. daily. She also had four blood transfusions, each of 250 c.c. citrated blood. Her general condition improved, and it was thought unwise to delay surgery. On April 30, the 61st day of her residence in the hospital, she was operated on by Dr. W. W. Haggart. A large inflammatory mass was found just to the right of the lumbar spine. While this mass extended downward, it did not seem to involve the cecum, as had been suggested in the roentgenograms. It was impossible to feel the bougie which was passed through the esophagoscope and it was deemed inadvisable to perform any type of fistula transplantation on account of the great amount of inflammatory reaction. A gastrostomy was performed and a filiform bougie was inserted from below, through the cardia and into the esophagus, issuing from a very small esophageal opening to the right and anteriorly to the point of the esophageal stricture. The filiform was then grasped through the esophagoscope with a forceps and was brought out through the proximal portion of the esophagus. A string, which had been attached to the filiform, was then brought out to be attached later to the other end issuing from the gastrostomy stoma. By esophagoscope, two grapefruit seeds were removed from the site of the esophageal stricture. After marsupialization of the stomach at the point of a small opening in the inferior portion, the abdomen was closed. Immediately following the operation the patient received a blood transfusion.

The day after the operation her temperature was 104° and her pulse was 105. Rectal temperatures ranged between 102 and 104° the next two days, after which the temperature declined, but the pulse ranged between 140 and 150. On the seventh postoperative day the rectal temperature began to go up again, ranging between 104 and 106°. The pulse was weak and almost uncountable.

On May 3 it became evident that peritonitis had developed. The abdomen became distended and tender and there was frequent vomiting of small amounts of brownish fluid. A Wangensteen tube was placed in the gastrostomy opening and the patient was given large doses of sulfathiazole by vein and intravenous fluids, with added vitamins and amino acids. Transfusions were also given. Death occurred on May 9, nine days after operation and the 70th day in the hospital.

The autopsy was performed by Doctor Mulligan of the Department of Pathology, seventeen hours postmortem. Of special interest are the findings with regard to the esophagus, the stomach, and the fistulous tract. These are quoted verbatim:

"The esophagus has a roughened, dark green lining and a greatly thickened wall. At a point 6 cm. proximal to the cardia of the stomach, the esophagus is narrowed and puckered to a diameter just admitting a small probe. At this point of narrowing and on the posterior wall is a perforation of the esophagus which enters a sinus tract 25 cm. long that connects with the lumen of the cecum posteromedially. The tract has a shaggy green lining and a thick, gristly, white wall. The tract extends posterolaterally on the right of the esophagus through the posterior margin of the right leaflet of the diaphragm, then posterior to the right adrenal, kidney and cecum and lateral to the bodies of the adjacent lumbar vertebrae. The caudal half of the right kidney and postero-medial part of the cecum are bound together and to the lumbar part of the vertebral column by gristly white tissue, so that sharp dissection is necessary for their removal. The stomach has a serosa irregularly plastered with shaggy yellow material, a thin wall and a dark red mucosa. On the anterior wall of the caudal half of the fundus is a jagged opening 8 cm. in circumference connecting with the recent laparotomy wound. To the right of this opening are two closely adjoining perforations 2 and 2.5 cm. in diameter. On the posterior wall of the stomach, adjacent to the greater curvature and 9 cm. distal to the pylorus, is another perforation 8 mm. in diameter. The three perforations connect with the peritoneal cavity. The small intestine is not remarkable except for irregular plastering of the surface by shaggy yellow material. The appendix is absent. The postero-medial portion of the cecum presents a 2-cm. round perforation which communicates with the caudal end of the sinus tract from the esophagus. In the transverse colon is a 5-mm. sessile mucosal polyp."

SUMMARY

There is presented a roentgenologically diagnosed case of esophageal stricture and esophagocecal fistula following lye burns about one and a half years previously. Due to the lack of any definite history of relevant acute or dramatic episodes, it is impossible to determine when the perforation of the esophagus occurred and whether it was the direct result of the lye injury or of instrumentation. Clinically, three points should be stressed: (1) The patient's history of flushing of the bowels and the appearance of the stools soon after eating was suggestive of an esophageal or gastric enteric or colic fistula. (2) The pain in the loin with favoring of the right side and splinting of the abdomen suggested ileopsoas spasm. Finally (3), the failure to gain in weight after apparently successful dilatation of the esophageal stricture, in conjunction with the flushing of the bowels and pain in the loin, comprises a highly significant group of symptoms. It is a matter of conjecture whether a rather recent appendectomy had any bearing on the perforation of the fistula into the cecum. The immediate cause of death (peritonitis and bronchopneumonia following gastrostomy and perforations of the stomach) was independent of the reported esophageal and cecal lesions.

4200 East 9th Ave.
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Calcified Spinal Meningioma[1]

ELLIS C. OSGOOD, M.D.,[2] JOHN H. ARNETT, M.D.,[3] and FREDERICK H. LEWY, M.D.[4]

Philadelphia, Penna.

While meningiomas within the cranial cavity are common, they are seen less frequently within the spinal canal. Still less common is the variety of spinal meningioma which shows sufficiently dense calcification to be visible on the roentgenogram. The opportunity to study such a case prompts the present report.

F. M., an 84-year-old white woman, began to complain of numbness of both hands in June 1939. This symptom progressed gradually and was soon accompanied by pain and weakness. Touch sensation in the hands was diminished but not lost.

A roentgenogram made June 19, 1939, showed considerable diffuse demineralization of the cervical and upper thoracic spine. In the spinal canal, from the level of the lamina of the seventh cervical vertebra to the lamina of the second thoracic vertebra, was a homogeneous, almond-shaped area of calcification which evidently filled the spinal canal almost

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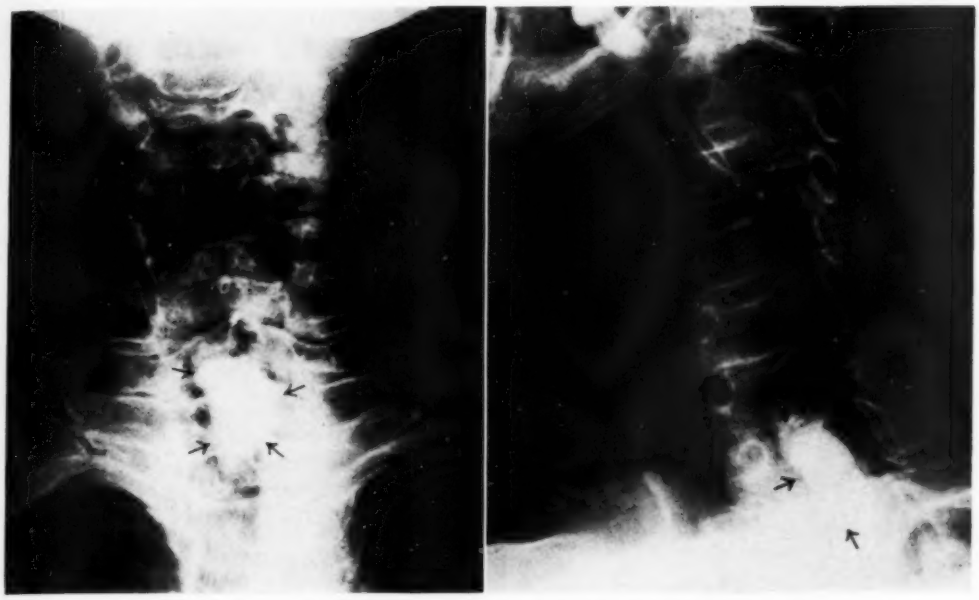

Figs. 1 and 2. Anteroposterior and oblique roentgenograms showing intraspinal calcification.

completely (Figs. 1 and 2). The lamina and the bodies of the vertebrae were intact, and the intervertebral foramina were not enlarged.

A therapeutic trial of x-ray irradiation was decided upon, though without much hope of success. Before this could be completed, cardiovascular complications developed which resulted in death three months later.

Autopsy by Dr. John Hand showed calcification of the mitral and aortic valves, myocardial degeneration, and hypostatic pneumonia. In the seventh cervical and first thoracic segments the spinal cord was found to be partly enveloped by a C-shaped calcium plaque about 4 cm. long and 2 to 5 mm. thick. This tumor was completely calcified and was granular or sandy when cut. Microscopic examination (Dr. Lewy) showed a diffuse mild gliosis in the region of the right pyramidal tracts. There was extensive arteriosclerosis, and hemorrhages were seen in the gray matter on the right side, with destruction of nerve cells but without glial reaction. In the decalcified specimen a fine network of arachnoid cells was seen, embedded in which were numerous concentric calcified psammoma bodies. The microscopic diagnosis was meningioma, psammomatous type, of the spinal cord (Figs. 3 and 4).

Meningiomas of the spinal cord are not uncommon, making up about 25 per cent of all spinal cord tumors (Elsberg, Brown). They are found most frequently in the thoracic cord (78 per cent), less frequently in the cervical cord (18 per cent) and lumbar and lumbosacral region (4 per cent) (Brown).

Clinically the meningiomas present no specific symptomatology or physical signs. Brown states that "the clinical diagnosis is usually no more specific than that of extramedullary, intraspinal tumor." A preoperative suspicion of meningioma is entertained only in those cases in which there is roentgenographic evidence of intraspinal calcification. Unlike the intracranial meningiomas, the spinal variety seldom, if ever, produces hyperostosis in the adjacent bones (Cushing), and destruction or erosion of bony structures is infrequent.

A number of cases presenting a positive roentgen picture have been reported (Gray). These have been of the psammomatous or osteoblastic type. In the former, laminated calcareous concretions are found, along with irregular deposits of calcium; while in the latter, zones of mature bone formation may be present in addition. These two types of meningioma made up 15 per cent of Brown's series of 130 cases, but in only 4 per cent of these types was

Fig. 3. Calcified spinal meningioma: photograph of gross specimen.

the calcification sufficient to cast a roentgen shadow. Thus it is obvious that only an occasional "rare variant" will be encountered in which there will be an opportunity to make a roentgen diagnosis.

This lesion is usually seen as an almond-shaped mass of calcium lying in the region of the spinal canal, although occasionally the calcification is more granular in appearance, in which case visualization is more difficult. Dyke lists one case in which a diagnosis was made without demonstration of distinct calcification. In this case an unusually dense soft-tissue swelling lateral to the vertebral column was seen, and the increased density of the mass was correctly interpreted as being due to a diffuse calcification; hence the lesion was presumably a meningioma. Calcification is practically never seen in other spinal cord tumors. Tumors of the gliomatous group, which commonly show calcification when situated in the brain, are rarely seen to contain calcium when present in the spinal cord (Elsberg), although Gray has recently reported a case showing calcification in the roentgenogram which was thought at operation to be a vascular oligodendroglioma or an hemangioblastoma. If the calcification is shown in lateral and oblique views to be entirely within the spinal canal, the probabilities of a meningioma being present are great. In most other lesions in the vicinity in which calcium might be present in visible amounts, the changes are not limited to the spinal canal but involve the adjacent structures as well.

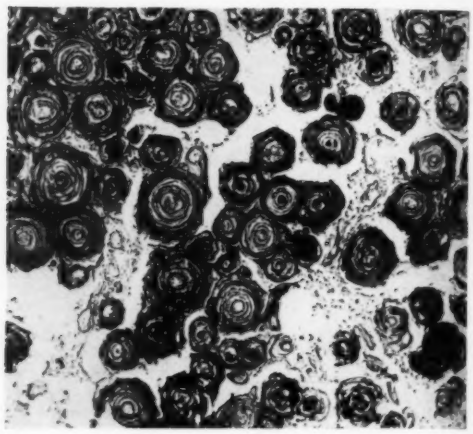

Fig. 4. Photomicrograph of tumor: psammomatous meningioma.

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Unusual Stab Wound[1]

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and
BERNARD S. KALAYJIAN, M.D.
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Stab wounds are frequently seen in the emergency rooms of large municipal hospitals. The unique aspect of the case to be reported here was the retention of a major part of the inflicting instrument in the depth of the wound, unknown to the patient or to the physician at the time of the injury.

R. L., a colored male, aged 27, was stabbed in the left side of the face during an altercation with a drunken acquaintance in April 1942. Examination in the emergency room showed only a small laceration, about 1 inch long, in the region of the middle of the left zygoma. Probing failed to reveal any evidence of foreign material, and the lesion was cleansed and sutured; the patient was given a prophylactic dose of tetanus antitoxin and discharged to the clinic for further care. The wound healed by first intention, and the patient was discharged from the clinic five days later, with no complaints, no redness or swelling of the wound, no discharge, no local pain or fever.

On Aug. 26, 1942, about four months after the original injury, the patient returned to the hospital, complaining of pain and stiffness of the jaw. About one month after the stabbing, he began to be troubled with pain in the region of the left zygoma, and he experienced progressive inability to open the mouth completely. The pain in the left side of the face came on insidiously and gradually and never was very acute; it was made worse by opening or closing the jaw. During the last month, a point had been reached where, because of the pain and progressive stiffness, the jaw could be opened only about one inch, and the patient was depending entirely upon liquids for nourishment. He had no other complaints. There was no history of chills, fever, swelling, localized tenderness, or drainage from the site of injury.

The patient was well developed, well nourished, and in no acute distress. The temperature was 98.6°; pulse 84; respirations 22; blood pressure 124/82. The head was normal in size, shape, and contour. There was a small, well healed scar about 1 inch in length just above and parallel to the long axis of the left zygomatic arch, midway between the outer canthus of the left eye and the left external auditory meatus. There was no swelling, redness, tenderness, or increased heat in this area. Opening the mouth, either actively or passively, was difficult and painful, and the upper and lower jaw could not be separated more than an inch. Except for this, the physical findings were without significance. The blood and urine were normal and the Wassermann reaction was negative.

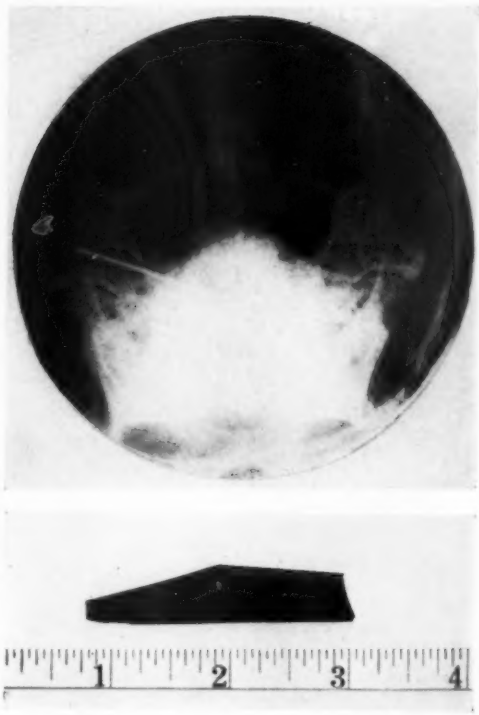


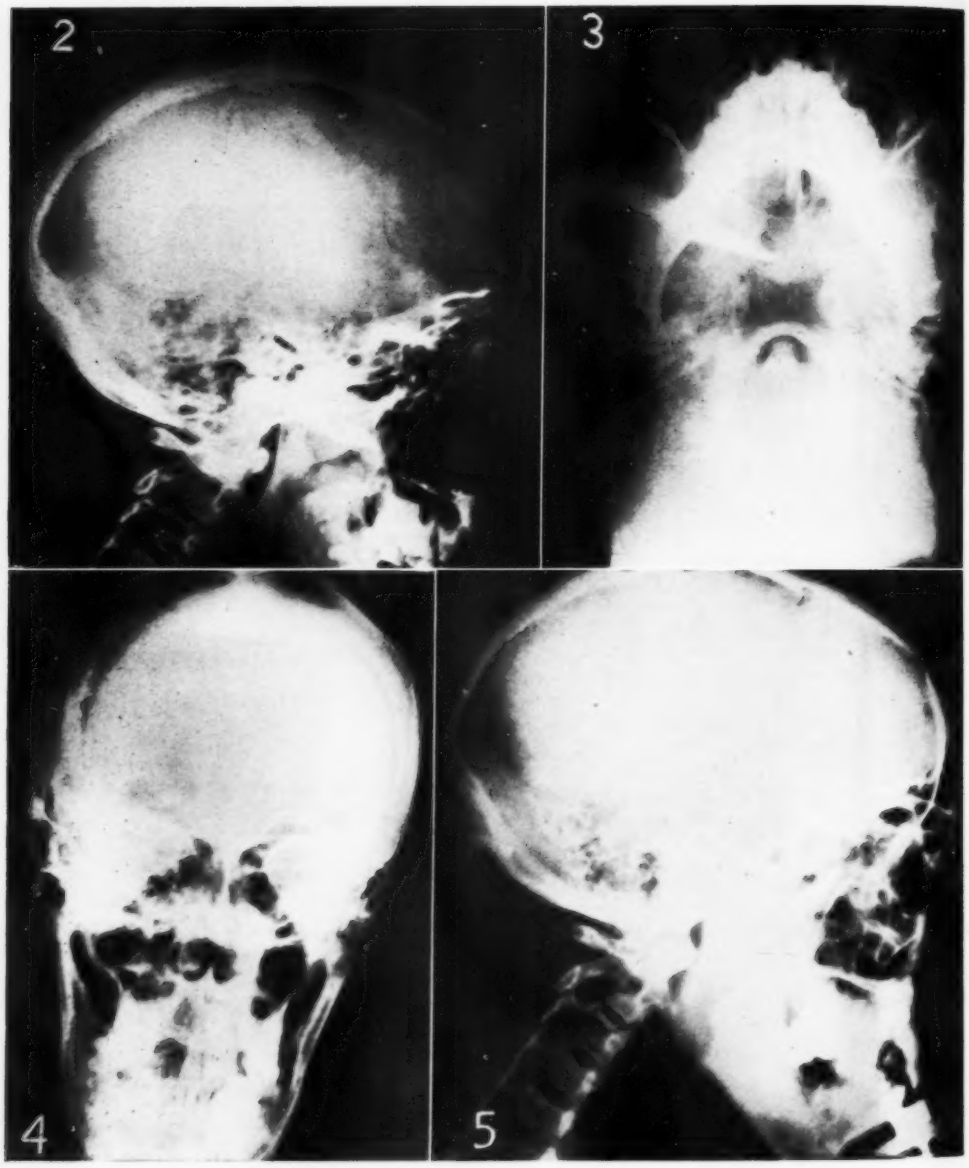
Fig. 1. Knife blade *in situ* (postero-anterior view) and after removal.

Multiple roentgenograms of the skull and jaw revealed the presence of a knife blade, about 2 1/4 inches long and 1/2 inch in width in the soft tissues of the left side of the face. The fragment of blade extended medially, slightly downward and forward from a point just below and medial to the left zygomatic arch (Figs. 1, 2, and 3).

It was apparent that this part of the knife blade had broken off within the wound at the time of the stabbing four months previously, and that it had been buried so deeply that it was not detected at that time. Careful re-examination, with particular attention to the roof of the mouth and the nasal cavity, failed to show any visible or palpable evidence of the blade.

Under sodium pentothal anesthesia a curving incision about 3 inches long was made over the left

[1] From the Departments of Surgery, Medical College of the State of South Carolina and the Roper Hospital, Charleston, S. C. Accepted for publication in November 1943.



Figs. 2–5. Figures 2 and 3 are lateral and submentobregmatic views, showing the knife blade *in situ*. Figures 4 and 5 were made after removal of the blade.

zygoma and parallel to the arch. With care to avoid branches of the facial nerve, the fibers of the masseter muscle were split and the tissue under the zygoma was explored. Nothing could be found until some of the zygomatic arch was rongeured away, when finally, after more searching, dissecting, and palpating, the lateral end of the blade was located. The blade was grasped and extracted with some difficulty but, as it came out, the tiny bent tip (Figs. 1 and 3) broke off and remained deep in the tissues. It was thought unwise and unnecessary to pursue the search for this small fragment, since it was considered unlikely that it would cause any further trouble (Figs. 4 and 5). The wound was sprinkled with sulfathiazole powder and closed in layers with interrupted silk without drainage. Healing was *per primam*, and no evidence of infection or facial nerve paralysis was noted.

Within a week, the patient was completely relieved of all pain in the side of the face. The pain and stiffness of the jaw gradually passed off, so that about one month postoperatively he was able to open his jaw normally and chew all kinds of food. He was seen one year later, at which time he had no complaints relative to this episode.

Roper Hospital
Charleston, S. C.

EDITORIAL

Howard P. Doub, M.D., Editor

John D. Camp, M.D., Associate Editor

The Significance of the Negative Roentgenogram in the Search for Pulmonary Tuberculosis

Reports of cases of pulmonary tuberculosis among the Armed Forces, despite the routine x-ray examination of inductees, naturally raise a question as to the effectiveness of the roentgen method for the discovery of tuberculous lesions. Criticisms of the particular procedure used, as recently voiced by Meyers (1), are not well founded, as can be attested by anyone who has had experience in an induction center. Actually, the relatively few cases subsequently discovered (2) can well be accounted for by factors other than the use of photofluorography. The addition of the skin tuberculin test, as advocated by Meyers, would scarcely contribute anything but delay to the information necessary for determining whether or not an inductee should be accepted. In assessing the various causes for the apparent failure to eliminate all cases of pulmonary tuberculosis by roentgen examination, the matter of the latent period which must exist between the inception of any disease process and its x-ray demonstration should be given consideration.

That there is a delay between the onset of symptoms of disease and the first appearance of roentgen signs is well illustrated in the case of acute osteomyelitis, the time interval here being fairly accurately established. In the case of pneumonia, also, there is fairly good evidence. We have seen one case in which clear-cut roentgen findings were observed within two and a half hours after the first symptoms, but in most instances six hours appears to be the minimum (3). In pulmonary tuberculosis the onset of symptoms is less important, since it is rare that a tuberculous lesion in the lung capable of producing symptoms is not already clearly demonstrable in the roentgenogram.

There is, however, a latent period between the inception of the tuberculous infection and the appearance of roentgen evidence of a lesion. The tubercles must develop, a number of them must coalesce, and an accumulation of abnormal material at least 5 mm. in diameter must ordinarily be present, before x-ray findings are diagnostic. Some years ago, in an attempt to determine the length of this latent period, we studied (4) a small number of cases in which the time of exposure to tuberculosis could be well established and in which repeated x-ray examinations had been made. In this group eleven weeks appeared to be the minimum time between the first exposure and the appearance of a nodule or other shadows less than 1 cm. in diameter. Our subsequent experience had seemed to bear out this observation until recently, when a medical student was encountered who exhibited a nodule 1 cm. in diameter, not previously present, occurring but eight weeks after a clear-cut exposure to tubercle bacilli.

Barnwell (5) has recently reported some cases among nurses, in one of whom an extensive cavitating tuberculosis was seen within fifty-six days after contact. While it is difficult to conceive of tuberculosis advancing so rapidly from the first introduction of the infection, especially in a patient with no preceding pulmonary lesion, yet there are other cases in the literature which substantiate this finding.

In an extremely interesting and instructive monograph by Malmros and Hedvall

of the University of Lund in Sweden, previously reviewed by Dr. A. T. Laird (7), to whom I am indebted for an English translation, some further light is thrown upon this problem. Within a group of 47 carefully studied cases there were 9 in which the time between the first occurrence of a positive skin tuberculin reaction and the appearance of diagnostic x-ray signs could be definitely ascertained. In 7 of these the period ranged from six to eighteen weeks. In the other 2 only ten and twenty-one days elapsed, but in these cases symptoms and a positive sputum were already present, so that the time of the onset of the infection is in doubt.

The determination of the variations in the time required for the development of roentgen signs of pulmonary tuberculosis is a sector of knowledge which is important and has received too little attention. It is evident that four or five months may well elapse between the inception of the disease and its roentgen demonstration. Under such circumstances the negative roentgenogram may have little significance. A certain percentage of the inductees or, for that matter, of any symptomless group being surveyed for tuberculosis, may well escape detection roentgenologically because the lesion is insufficiently developed to produce roentgen signs. What proportion of the cases now being uncovered fall into this class it is impossible to say. But such considerations do indicate, as suggested by Meyers (1), that re-examination at the end of the first six months in service would be useful in eliminating some men in whom clinical tuberculosis will later develop. Negative findings on the second examination would be of greater significance. Furthermore, this procedure would contribute immeasurably to our knowledge of the development of tuberculosis in young persons.

LEO G. RIGLER, M.D.

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REFRESHER COURSES: POST-GRADUATE INSTRUCTION

A series of Refresher Courses will be presented at the time of the Joint Meeting of the American Roentgen Ray Society and the Radiological Society of North America, at the Palmer House, Chicago, Sept. 24–29, 1944.

These courses of post-graduate instruction will be given from 2 to 5 P.M. and 7 to 9 P.M. on Sunday, Sept. 24, and from 8:30 to 10 A.M. daily thereafter during the meeting. Nothing else will be scheduled for these hours, and the courses have been so arranged that those interested in a particular subject may enroll in a related series.

The courses will be held on the Fourth and Club Floors of the Palmer House. Admission will be by ticket only, and reservations will be made in the order in which applications are received. Those who are not members of either of the two participating societies will be charged a fee of Two Dollars ($2.00) for a single course or a maximum charge of Five Dollars ($5.00) for the series. Members of the Armed Forces, residents and fellows in radiology will be exempt from these charges.

Read the description of the courses, noting particularly the days upon which they are offered; study the Plan of Presentation and select carefully your choice for each day, as the number attending each course will be limited. If the directions listed on the Plan of Presentation and Instructions for Enrollment are observed, errors will be avoided.

If the Refresher Courses are not filled by the time of the meeting, tickets will be available at the registration desk, Sunday, Sept. 24, and thereafter.

It may be necessary to alter or revise some of the courses and to change some of the instructors. We will, however, adhere as closely as possible to the choices made.

Course No. 1: Sunday, 2–5 P.M.

Diseases of the Esophagus, Stomach, and Duodenum: Panel Discussion

Staff of Presbyterian Hospital, University of Illinois (Rush) College of Medicine, Chicago, Ill.
(By Invitation)

FAY H. SQUIRE, M.D.
Chicago, Ill.
Presiding

JAMES B. EYERLY, M.D., GEORGE J. RUKSTINAT, M.D., JOHN M. DORSEY, M.D., and DANELY P. SLAUGHTER, M.D.

JAMES B. EYERLY, M.D.

1. Medical aspects of diseases of the esophagus, stomach, and duodenum.
   (*a*) Physiology.
   (*b*) Types of diseases.
   (*c*) Treatment.

FAY H. SQUIRE, M.D.

2. Radiologic examination of stomach and duodenum, demonstrating pathologic changes.

GEORGE J. RUKSTINAT, M.D.

3. Pathologic anatomy of esophagus, stomach, and duodenum.

JOHN M. DORSEY, M.D.

4. Surgery of the esophagus.
   (*a*) Anatomy.
   (*b*) Surgical diseases.
      (1) Congenital abnormalities.
      (2) Infections.
      (3) Tumors.

DANELY P. SLAUGHTER, M.D.

5. Surgery of the stomach and duodenum.
   (*a*) Anatomy of stomach and duodenum.
   (*b*) Gastric and duodenal ulcer and carcinoma.
   (*c*) Congenital obstruction of duodenum.
   (*d*) Chronic duodenal ileus.

Course No. 2: Sunday, 2–5 P.M.

Roentgenologic Diagnosis of Neurological Lesions: Panel Discussion

Staff of the University of Illinois College of Medicine

Arranged by the late
ADOLPH HARTUNG, M.D.

T. J. WACHOWSKI, M.D.
Asst. Professor in Radiology
Presiding

ERIC OLDBERG, M.D., Professor of Neurology and Neurological Surgery (by invitation)
PERCIVAL BAILEY, M.D., Professor of Neurology and Neurological Surgery (by invitation)
PAUL C. BUCY, M.D., Professor of Neurology and Neurological Surgery (by invitation)
A. S. J. PETERSEN, M.D., Associate in Radiology

Brief historical review of the roentgenologic methods used in neurologic diagnosis. Technical procedures with and without contrast media. Interpretation of negatives with correlation of clinical and pathological findings. Specific information in response to requests from the audience.

Course No. 3: Sunday 2–5 P.M.

Nuclear Physics: 2–3 P.M.

K. W. STENSTROM, Ph.D.
Minneapolis, Minn.

Discussion will include a simple description of the

newer nuclear physics, including subnuclear particles such as protons, neutrons, positrons, mesotrons, etc., and the apparatus for producing them as the cyclotron, the electrostatic generator, and the betatron.

Information Please: 3–5 P.M.

U. V. PORTMANN, M.D. Cleveland, Ohio, Moderator
EDITH H. QUIMBY, Sc.D., New York, N. Y.
OTTO GLASSER, Ph.D., Cleveland, Ohio
JAMES L. WEATHERWAX, M.S., Philadelphia, Penna.
ROBERT S. LANDAUER, Ph.D., Highland Park, Ill.

Don't only try to "stump the experts" but send in questions on the Physics of Radiology which have been bothering you these many years. Send questions to Dr. U. V. Portmann, The Cleveland Clinic, Euclid Ave. at 93d Street, Cleveland 6, Ohio.

Course No. 4: Sunday, 7–9 P.M.

Carcinoma of the Breast: Panel Discussion

T. LEUCUTIA, M.D.
Harper Hospital, Detroit, Mich.
Presiding

J. J. MOORE, M.D., Pathologist, Chicago, Ill. (by invitation)
HARRY A. OBERHELMAN, M.D., Professor of Surgery, Loyola University School of Medicine, Chicago (by invitation)
B. H. ORNDOFF, M.D., Professor of Radiology, Loyola University School of Medicine
JANET TOWNE, M.D., Loyola University School of Medicine (by invitation)
Major JAMES C. COOK, M.C., Detroit, Mich. (by invitation)
E. WALTER HALL, M.D., Detroit, Mich. (by invitation)

Dr. Leucutia will briefly introduce the newer aspects of therapy of mammary carcinoma, with special attention to the estrogenic theory. Dr. Moore will discuss the various pathologic aspects. Dr. Oberhelman will present the surgical treatment. Dr. Towne will discuss the question of bilateral oophorectomy as a routine procedure, especially in the young, in all operable cases, and will take up the problem of roentgen as compared to surgical castration. Major Cook will consider colloidal lead therapy in conjunction with roentgen therapy. Dr. Orndoff will discuss the radiologic procedures as practised in the various stages of mammary carcinoma. Dr. Hall will discuss the late sequelae incident to over-irradiation, including pleuropulmonary as well as osseous changes.

Course No. 5: Sunday 7–9 P.M.

Film Reading Session

MERRILL C. SOSMAN, M.D.
Boston, Mass.
Presiding

ROSS GOLDEN, M.D., New York, N. Y.
EUGENE P. PENDERGRASS, M.D., Philadelphia, Penna.

Those attending this course are invited and requested to bring reports and roentgenograms of interesting or difficult cases for presentation and informal discussion. Only cases in which the diagnosis has been proved or in which the evidence is conclusive should be submitted. Those conducting the conference will depend upon voluntary submission of material by members of the audience.

Course No. 6: Monday, 8:30–10 A.M.

Gallbladder and Pancreas

B. R. KIRKLIN, M.D.
Rochester, Minn.

1. Cholecystography by the oral method, with emphasis on the necessity of meticulous care in administering the dye, in executing the roentgenographic technic, and in interpreting the cholecystographic response. Criteria of distinction between normal and abnormal response will be presented, with illustrative cholecystograms.
2. (*a*) Disclosure of tumors of the pancreas with the aid of opaque ingesta.
   (*b*) Roentgenographic demonstration of pancreatic calculi.

Course No. 7: Monday, 8:30–10 A.M.

Roentgenological and Pathological Study of the Pneumonias

L. R. SANTE, M.D.
Professor of Radiology, St. Louis University
St. Louis, Missouri

In recent years many causes have been found for pneumonia other than the pneumococcus. Many of these pneumonias have been described as atypical pneumonias of unknown etiology. The etiologic agents for these unusual forms are so multiple and varied that they may cause confusion to the radiologist. To clarify the situation, a comparative study of the roentgen manifestations of the various types of pneumonia with the pathological pictures which they produce has been undertaken.

Course No. 8: Monday, 8:30–10 A.M.

Practical Problems in Dosage Measurement

EDITH H. QUIMBY, Sc.D.
College of Physicians and Surgeons
Columbia University

This discussion will include the measurement of the quantity of x-rays in roentgens; the quality in half-value layer; the significance of air *vs.* backscatter measurements; percentage depth dose; exit dose; depth dose charts; isodose charts and dosage records.

Course No. 9: Monday, 8:30–10 A.M.

Pelvimetry by Modification of Various Methods

FRED O. COE, M.D.
Professor of Radiology, Georgetown University
Washington, D. C.

A survey film of the abdomen is first taken. This is followed by the conventional anteroposterior film as described by Thoms; a lateral view with the patient standing, using the dots for measurements; and a postero-anterior of the outlet following the method of Chassard and Lapine; a total of four films. The procedure is a modification of that used by Doctor Snow. All methods have been modified from the original description.

Course No. 10: Monday, 8:30–10 A.M.

Diaphragmatic Hiatus Hernia

Hernia of the Stomach through the Esophageal Hiatus of the Diaphragm

MAX RITVO, M.D.
Boston, Mass.

Diaphragmatic hernia of the hiatus type is a relatively common condition and must always be included among the causes of upper abdominal and chest complaints. This condition has not received from many clinicians and roentgenologists the full attention it merits. The symptomatology is indefinite and variable; hence, clinical diagnosis is usually impossible, and the patient is thought to have gallbladder disease, peptic ulcer, angina, etc. Many patients with hiatus hernia have been operated upon because of these incorrect diagnoses. The x-ray offers an accurate and dependable method of establishing the diagnosis; it demonstrates the size of the hernia and its relationship to adjacent structures. In addition, it is important in determining the question of operability.

In this presentation, the roentgen methods of demonstrating diaphragmatic (hiatus) hernias will be described in detail. The differential diagnosis will be discussed. The signs and symptoms will be outlined, and an attempt made to establish a clinical syndrome which may make a clinical diagnosis possible in many instances. The treatment of hiatus hernia will be outlined.

Lantern slide demonstrations will include hiatus hernias, other types of diaphragmatic hernia, and various lesions which may cause confusion in diagnosis.

Course No. 11: Tuesday, 8:30–10 A.M.

Technic of Diagnosis of Duodenal Lesions by the Mucosal Relief Method

F. E. TEMPLETON, M.D.
Cleveland Clinic
Cleveland, Ohio

The conditions influencing the demonstration of a mucosal surface, the equipment and the technic used in examining the stomach and duodenum are discussed. The factors influencing the demonstration of mucosal surfaces are outlined as follows:

A. Physical Factors.
   1. The state of the medium.
   2. The condition of the mucosa.
   3. The contents of the lumen.
   4. The build of the patient.

B. Anatomical Factors.
   1. Demonstration of the single surface.
   2. Demonstration of superimposed surfaces.
   3. Clinical application.
      (*a*) Under normal conditions.
      (*b*) Under pathological conditions.

C. Physiological Factors.
   1. Passive factors.
      (*a*) Respiration.
      (*b*) Position of the patient.
      (*c*) Transmitted pulsation.
      (*d*) Pressure.
         (1) Extrinsic.
         (2) Intrinsic.
      (*e*) Muscular.
         (1) Tonus.
         (2) Peristalsis.
   2. Active factors.
      (*a*) Autonomic theory of Forssell.

After briefly discussing the filming fluoroscope or "spot" machine, the technic of examination will be discussed in detail as follows:

A. Preparation of the patient.
B. The media.
C. Planning the examination.
D. Actual roentgenologic examination.
   1. A routine method.
      (*a*) Fluoroscopy.
   2. Procedures for special situations.
      (*a*) Diaphragmatic hernia, with a brief discussion of the phrenic ampulla.
      (*b*) Cascade stomach.
      (*c*) Pyloric obstruction
      (*d*) High posterior bulb and antrum.
      (*e*) Air in the duodenal bulb.
      (*f*) Patients too ill to stand.
      (*g*) Infants.
   3. Indications for exposing of the films.
      (*a*) The "spot" film.
      (*b*) The "survey" film.
   4. Application of pressure.

Course No. 12: Tuesday, 8:30–10 A.M.

Diseases of the Lesser Circulation

W. WALTER WASSON, M.D.
Denver, Col.

This course will be an attempt to discuss the dynamics of the lesser circulation, with a detailed presentation of the anatomy and the physiology. Every day the roentgenologist is endeavoring to evaluate in terms of pathology the air contents of the lungs and the dynamics of the chest as a whole, and particularly of the lesser circulation. It is hoped that a few facts may be added to

the present knowledge in regard to the lesser circulation. There will be a brief presentation of the clinical diseases of the lesser circulation.

Course No. 13: Tuesday, 8:30–10 A.M.

Radium Physics

K. E. CORRIGAN, Ph.D.
Detroit, Mich.

This discussion will cover natural radioactive disintegration, the particles emitted by radioactive materials, half life, average life, units, and the uranium disintegration series.

Course No. 14: Tuesday, 8:30–10 A.M.

Roentgen Therapy for Infectious Processes

WALTER C. POPP, M.D.
Section on Therapeutic Radiology, Mayo Clinic
Rochester, Minn.

A short introduction will be given covering the theories upon which the roentgen therapy of infections is based, as well as the experimental work of various investigators, and the action of the rays on infectious processes will be explained. Emphasis will be placed on the selection of technic for both acute and chronic processes. The handling of acute infections with small dosages will be considered in some detail. Statistics will be presented, indicating the experience in the treatment of acute sinusitis at the Mayo Clinic. Methods of treatment of a variety of common infections will be presented as individual entities.

Courses Nos. 15 and 20: Tuesday and Wednesday, 8:30–10 A.M.

Four Rare Diseases: Clinical, Pathological, and Roentgenological Aspects

1. Acute Disseminated Lupus
2. Periarteritis Nodosa
3. Erythema Nodosum
4. Sarcoidosis

MERRILL C. SOSMAN, M.D., HOWARD ARMSTRONG, M.D. (by invitation), and ORVILLE BAILEY, M.D. (by invitation)
Peter Bent Brigham Hospital and the Harvard Medical School
Boston, Mass.

(Course requires two days for completion. Not a repeater.)

These four diseases appear frequently enough in the roentgenologist's office to warrant detailed descriptions of their clinical course, laboratory diagnosis and the pathological findings and, above all, the roentgenographic aspects. One of them (acute disseminated lupus) has responded well to x-ray therapy. Complete summaries of each disease from the above-mentioned aspects will be presented along with illustrative cases and methods of treatment.

Course No. 16: Wednesday, 8:30–10 A.M.

Certain Aspects of Motility Disturbances in the Small Intestine

ROSS GOLDEN, M.D.
Professor of Radiology, College of Physicians and Surgeons, Columbia University
New York, N. Y.

The session on the motility disturbances in the small intestine will include a discussion of the normal anatomy and the basic physiology involved in the three groups of intestinal movements. After a brief consideration of the normal, the disturbed motor function associated with nutritional disorders, liver disease, hypoproteinemia, ileus, and allergy will be discussed. An attempt to explain these disturbed motor phenomena in the terms of basic physiology will be made.

Course No. 17: Wednesday, 8:30–10 A.M.

Diseases of the Mediastinum and Associated Conditions

LESTER W. PAUL, M.D.
Department of Radiology, University of Wisconsin
Madison, Wis.

In this discussion will be included those lesions which produce mass shadows of abnormal character within and adjacent to the mediastinum. The anatomy of the mediastinum and of the tracheobronchial lymph node system will be reviewed, followed by a discussion of the roentgen anatomy of these parts. The roentgen aspects of the diseases affecting the mediastinal and tracheobronchial lymph nodes will be presented in some detail, including acute and chronic non-specific infections, fungous infections, primary tuberculosis, and hyperplastic tuberculous adenitis in adults. In this latter connection the lymph node changes seen in erythema nodosum will be discussed. Also, reference will be made to sarcoid disease and an attempt will be made to correlate these conditions as far as present knowledge permits. The various primary and secondary tumors involving the lymph nodes will be covered, particularly Hodgkin's disease, lymphosarcoma, and metastases from primary tumors elsewhere.

Illustrative cases will be used in which serial roentgenograms show the appearance of the chest before the development of the disease, its course, and in some instances a return to normal. Emphasis will be placed on the recognition of early changes as shown by serial roentgenograms. Other diseases that may produce abnormal shadows in the mediastinum will be discussed, including lesions of the spine, pulmonary artery, aorta, esophagus, acute and chronic mediastinitis, intrathoracic thyroid, enlargement of the thymus, and certain forms of carcinoma of the bronchial tree. Cardiac lesions will not be included except as they must be differentiated from extracardiac abnormalities.

Plan of Presentation

SUNDAY 2–5 P.M.	MONDAY 8:30–10 A.M.	TUESDAY 8:30–10 A.M.
1. **Diseases of the Esophagus, Stomach, and Duodenum** F. H. Squire, M.D. J. B. Eyerly, M.D. G. J. Rukstinat, M.D. J. M. Dorsey, M.D. D. P. Slaughter, M.D.	6. **Gallbladder and Pancreas** B. R. Kirklin, M.D.	11. **Technic of Diagnosis of Duodenal Lesions by the Mucosal Relief Method** F. E. Templeton, M.D.
2. **Roentgenologic Diagnosis of Neurological Lesions** T. J. Wachowski, M.D. Eric Oldberg, M.D. Percival Bailey, M.D. P. C. Bucy, M.D. A. S. J. Petersen, M.D.	7. **Roentgenological and Pathological Study of the Pneumonias** L. R. Sante, M.D.	12. **The Diseases of the Lesser Circulation** W. Walter Wasson, M.D.
3. **Nuclear Physics: 2–3 P.M.** K. W. Stenstrom, Ph.D. **Information Please: 3–5 P.M.** U. V. Portmann, M.D. Edith H. Quimby, Sc.D. Otto Glasser, Ph.D. J. L. Weatherwax, M.S. R. S. Landauer, Ph.D.	8. **Practical Problems in Dosage Measurement** Edith H. Quimby, Sc.D.	13. **Radium Physics** K. E. Corrigan, Ph.D.
7–9 P.M.	9. **Pelvimetry by Modification of Various Methods** Fred O. Coe, M.D.	14. **Roentgen Therapy for Infectious Processes** W. C. Popp, M.D.
4. **Carcinoma of the Breast** T. Leucutia, M.D. J. J. Moore, M.D. H. A. Oberhelman, M.D. B. H. Orndoff, M.D. Janet Towne, M.D. Maj. J. C. Cook, M.C. E. W. Hall, M.D.		
5. **Film Reading Session** M. C. Sosman, M.D. Ross Golden, M.D. E. P. Pendergrass, M.D.	10. **Diaphragmatic Hiatus Hernia** Max Ritvo, M.D.	15. **Four Rare Diseases: Clinical, Pathological, and Roentgenological Aspects (Acute Disseminated Lupus; Periarteritis Nodosa; Erythema Nodosum; Sarcoidosis)** ***(Continued Wednesday)*** M. C. Sosman, M.D. Howard Armstrong, M.D. Orville Bailey, M.D.

Plan of Presentation

WEDNESDAY 8:30–10 A.M.	THURSDAY 8:30–10 A.M.	FRIDAY 8:30–10 A.M.
16. **Certain Aspects of Motility Disturbances in the Small Intestine** Ross Golden, M.D.	21. **Lesions of the Colon Frequently and Easily Overlooked** Harry M. Weber, M.D.	26. **Roentgen Manifestations of Acute Abdominal Disorders** Leo G. Rigler, M.D.
17. **Diseases of the Mediastinum and Associated Conditions** L. W. Paul, M.D.	22. **Pulmonary Tuberculosis** C. C. Birkelo, M.D.	27. **X-ray Findings in Low Back Pain** H. E. Potter, M.D.
18. **Electronics in Radiology** Otto Glasser, Ph.D.	32. **Roentgen Differentiation of Abdominal Tumors** Samuel Brown, M.D.	28. **Gynecography; Pneumoperitoneum and Hysterosalpingography** R. A. Arens, M.D. I. F. Stein, M.D.
19. **Biologic Reactions of Tissue to Radiation** Maj. M. Friedman, M.C.	24. **Radiotherapy of Hodgkin's Disease and Lymphosarcoma** Maurice Lenz, M.D.	29. **Carcinoma of the Uterus** H. E. Schmitz, M.D. J. F. Sheehan, M.D.
20. **Four Rare Diseases: Clinical, Pathological, and Roentgenological Aspects (Acute Disseminated Lupus; Periarteritis Nodosa; Erythema Nodosum; Sarcoidosis)** ***(Continued from Tuesday)***	25. **Roentgenology of the Urinary Tract** ***(Continued Friday)*** E. P. Pendergrass, M.D. G. W. Chamberlin, M.D. P. Boland Hughes, M.D.	30. **Roentgenology of the Urinary Tract** ***(Continued from Thursday)***

Course No. 18: Wednesday, 8:30–10 A.M.

Electronics in Radiology

OTTO GLASSER, Ph.D.
Cleveland Clinic
Cleveland, Ohio

This is a new course, being given for the first time. Dr. Glasser will correct the impression being foisted on the American public, of the "newness" of Electronics, which actually is about fifty years old. This promises to be a highly interesting session.

Course No. 19: Wednesday, 8:30–10 A.M.

Biologic Reactions of Tissue to Radiation

Major MILTON FRIEDMAN, M.C.
Army Medical Center
Washington, D. C.

The development of radiation therapy technics has been predominantly based on the disappearance of the tumor and the cure rate. These indexes are too remote from the immediate event to permit observation and evaluation of a specific technic. Hence the great number of "schools" of treatment.

The application of certain clinical and experimental observations of the immediate response of the tumor are helpful in reducing empiricism in radiation therapy. The mechanisms of the histologic effect of radiation on tumors, the recovery processes, and the lethal tumor dose are three features discussed and correlated.

Histologic examination of biopsy specimens of a tumor under irradiation yields information of fundamental importance concerning the efficiency of treatment technic for a particular case. Radiation destroys tumor cells in several ways. Radiosensitive tumors are affected differently from radioresistant tumors. Observation of the rate and method of recession of different tumors suggests specific rates of application of radiation for each type of tumor.

Consideration of the recovery process becomes progressively more important with increased understanding of its behavior.

It is necessary to construct the plan of treatment on the basis of the daily and total tumor dose in order to apply intelligently the above principles. This procedure permits intelligent handling of a lesion, reveals the inefficiency of many commonly employed radiation technics, and places the treatment on a substantial basis.

Course No. 21: Thursday, 8:30–10 A.M.

Lesions of the Colon Frequently and Easily Overlooked

HARRY M. WEBER, M.D.
Mayo Clinic
Rochester, Minn.

Advanced pathologic processes occurring in the large intestine usually produce relatively marked morphologic changes in the part of the intestine affected, and so are discovered without great difficulty roentgenologically. Certain clinically important lesions, however, never become large, or produce alarming symptoms even when small, or are encountered so early in their development that very obvious morphologic changes have not as yet taken place, and thus are easily overlooked at roentgenologic examination. This discussion will be limited to the roentgenologic diagnosis of small neoplastic lesions of the large intestine and to those roentgenologically recognizable changes which signify the earliest manifestations of certain important nonneoplastic lesions of this division of the alimentary tract.

The conduct of the roentgenologic examination of the large intestine will be reviewed briefly, and advantages and limitations of the various diagnostic procedures currently used in this field will be discussed in considerable detail.

Course No. 22: Thursday, 8:30–10 A.M.

Pulmonary Tuberculosis

C. C. BIRKELO, M.D.
Radiologist, Herman Kiefer Hospital and Maybury Sanatorium
Detroit, Mich.

This presentation will consist of a lantern slide demonstration of both common and unusual forms of pulmonary tuberculosis. The primary tuberculous infection as it occurs in the child and young adult will be demonstrated. Reinfection tuberculosis of both the productive and exudative types will be shown, and the commonly accepted methods of treatment will be briefly discussed.

Differential diagnosis will include x-ray demonstration of cases which resemble tuberculosis but have been found to be bronchopneumonia, primary and metastatic tumors of the lungs, bronchiectasis and cystic disease, lung abscess, mitral heart disease, and silicosis. All material presented will consist of proved cases.

Course No. 23: Thursday, 8:30–10 A.M.

Roentgen Differentiation of Abdominal Tumors

SAMUEL BROWN, M.D.
Cincinnati, Ohio

This course will cover the roentgen diagnosis of extra-gastro-intestinal tumors by an indirect method of approach which consists in the study of the stomach and bowels in their relation to the neighboring organs. It has been found that, in the presence of a tumor arising from any of the adjacent organs, characteristic changes take place in the relation, position, and contour of the hollow viscera according to the position of the body as a whole. With these facts at our disposal, it has been possible to diagnose the presence, location, and origin of many a tumor in the abdomen.

Course No. 24: Thursday, 8:30–10 A.M.

Radiotherapy of Hodgkin's Disease and Lymphosarcoma

MAURICE LENZ, M.D.
New York, N. Y.

Though primary regression of most clinically appreciable masses of Hodgkin's disease and lymphosarcoma is usually obtained by x-ray therapy, survival beyond three years is observed in only a small proportion of cases. In an effort to analyze the causes of these poor results, the relationship between the clinical characteristics and the technic of x-ray therapy was studied in all patients with Hodgkin's disease and lymphosarcoma treated by x-ray at the Presbyterian Hospital, New York, between 1915 and 1941. The result of this investigation will be discussed informally.

Courses Nos. 25 and 30: Thursday and Friday, 8:30–10 A.M.

Roentgenology of the Urinary Tract

EUGENE P. PENDERGRASS, M.D., GEORGE W. CHAMBERLIN, M.D., B.S., Sc.D., and P. BOLAND HUGHES, M.D. (by invitation)
University of Pennsylvania
Philadelphia, Penna.

(Course requires two days: the first three items being considered on the first day and the second three on the second day.)

1. Roentgen methods and materials.
   - (*a*) Evaluation of types of examination.
   - (*b*) Uses and limitation of roentgen procedures.
   - (*c*) Dangers of urography.
2. The normal urinary tract.
   - (*a*) Physiology.
   - (*b*) Anatomy.
   - (*c*) Roentgen interpretation.
3. Anomalies and variants.
   - (*a*) Embryology of some of the common anomalies.
   - (*b*) Role of anomalies in development of disease.
   - (*c*) Late results of anomalies
4. Roentgen interpretation of genito-urinary tract disease.
   - (*a*) Stones.
   - (*b*) Infections.
   - (*c*) Tumors.
   - (*d*) Cysts.
   - (*e*) Miscellaneous.
5. Value of urography in disease primarily outside of the urinary tract.
   - (*a*) Aneurysms.
   - (*b*) Retroperitoneal tumors and infections.
6. Cytoscopy and urethrography.

Course No. 26: Friday, 8:30–10 A.M.

Roentgen Manifestations of Acute Abdominal Disorders

LEO G. RIGLER, M.D.
Professor of Radiology, University of Minnesota
Minneapolis, Minn.

1. Roentgen technic in acute abdominal disorders.

Special technical procedures are necessary in the handling of patients. Variations from the usual technic in the examination of the abdomen, the difficulties, and special procedures necessary will be detailed.

2. Indications for roentgen examination in the acute abdominal disorders.

The various acute processes in the abdomen in which roentgen examination is of great assistance in establishing either the diagnosis or aiding in determining the extent and nature of the process will be presented.

3. Analysis of the scout film of the abdomen.
   - (*a*) The normal appearance of the roentgenogram of the abdomen without contrast medium.

The soft-tissue shadows, the appearance of the gastro-intestinal tract with and without preparation and under varying conditions will be demonstrated.

   - (*b*) The abnormal roentgenogram without contrast medium.

A discussion of the physiologic and pathologic factors in the production of changes in the abdomen will be undertaken.

An analysis of the various findings which can be obtained with different types of acute abdominal disorders and their differential diagnosis will be presented.

Demonstrations will be given of the x-ray findings in:

   - (1) Peritonitis.
   - (2) Intra-abdominal abscess.
   - (3) Small intestinal obstruction.
   - (4) Large intestinal obstruction.

4. Value of x-ray examination in the acute abdominal disorders.

An estimation of the reliability of the various x-ray signs and their contribution toward the practical handling of the patient will be presented.

Course No. 27: Friday, 8:30–10 A.M.

X-ray Findings in Low Back Pain

HOLLIS E. POTTER, M.D.
Chicago, Ill.

A review of both the more common and the rarer x-ray findings in low back pain which must be considered in the clinical diagnosis, the prognosis, and the treatment. Differentiation between vertebral injury and vertebral disease, congenital or acquired.

Course No. 28: Friday, 8:30–10 A.M.

Gynecography: Pneumoperitoneum and Hysterosalpingography

ROBERT A. ARENS, M.D. and IRVING F. STEIN, M.D.
(by invitation)
Michael Reese Hospital
Chicago, Ill.

This presentation will consist of a round-table discussion including the history, armamentarium required, and technic of complete gynecography, including transuterine and transabdominal methods, pneumoperitoneum and hysterosalpingography alone and combined. The radiological procedure, including the exposure, distance, posture, etc., will also be shown. Consideration will be given to the diagnostic value of the method, its therapeutic application in tuberculous peritonitis and salpingitis, and also the value of transuterine insufflation in sterility. The teaching value of the method for students will be stressed. Lantern demonstration.

Course No. 29: Friday, 8:30–10 A.M.

Carcinoma of the Uterus

HERBERT E. SCHMITZ, M.D., and JOHN F. SHEEHAN
M.D. (by invitation)
Loyola University School of Medicine
Chicago, Ill.

This course will consider the early diagnosis, planning of treatment, dosage, and the more common complications of carcinoma of the uterus and of the uterine cervix. Pathologic changes induced by radiation in carcinoma of the uterus and in the uterus itself will be presented.

JOINT MEETING AMERICAN ROENTGEN RAY SOCIETY and RADIOLOGICAL SOCIETY OF NORTH AMERICA

Attention is again called to the joint meeting of the American Roentgen Ray Society and the Radiological Society of North America, to be held in the Palmer House, Chicago, Sept. 24 to 29, 1944.

The usual Annual Refresher Series will be presented. Details of the courses appear elsewhere in this issue.

FLORIDA RADIOLOGICAL SOCIETY

The newly elected officers of the Florida Radiological Society, serving for the coming year, are as follows: President, Walter A. Weed, M.D., of Orlando; Vice-President, John A. Pines, M.D., Orlando; Secretary-Treasurer, Charles M. Gray, M.D., Tampa.

MINNESOTA RADIOLOGICAL SOCIETY

At the annual meeting of the Minnesota Radiological Society, held at Rochester at the time of the meeting of the State Medical Society, the following officers were elected for the ensuing year. President, K. Wilhelm Stenstrom, Ph.D., Vice-President, Russel Wright Morse, M.D., Secretary-Treasurer, A. T. Stenstrom, M.D., all of Minneapolis.

Dr. Ralph Bromer was invited to deliver the annual Carman Lecture. He was also guest of honor and speaker at the annual dinner at the Rochester Country Club.

NORTH CAROLINA RADIOLOGICAL SOCIETY

At the recent annual meeting of the North Carolina Radiological Society, the following officers were elected: President, Walter W. Vaughan, M.D., Durham; Vice-President, Allen Tuggle, M.D., Charlotte; Secretary-Treasurer, Major I. Fleming, M.D., Rocky Mount.

RADIOLOGICAL SOCIETY OF NEW JERSEY

At the annual meeting of the Radiological Society of New Jersey, held in Atlantic City on April 26, 1944, the following officers were elected: President, J. H. Wyatt, M.D., Newark; Vice-President, H. J. Perlberg, M.D., Jersey City; Secretary, H. R. Brindle, M.D., Asbury Park; Treasurer, W. H. Seward, M.D., Orange; Counsellor, W. O. Wuester, M.D., Hillside.

INTERNATIONAL COLLEGE OF SURGEONS

The Ninth Annual Assembly of the International College of Surgeons will be held Oct. 3–5, 1944, at the Benjamin Franklin Hotel, Philadelphia. The program will be devoted to War, Rehabilitation, and Civilian Surgery. Dr. Rudolph Jaeger of Jefferson Medical College is General Chairman of the Committee on Arrangements.

Books Received

Books received are acknowledged under this heading and such notice may be regarded as recognition of the courtesy of the sender. Reviews will be published in the interest of our readers and as space permits.

TUBERCULOSIS OF THE EAR, NOSE, AND THROAT: INCLUDING THE LARYNX, THE TRACHEA, AND THE BRONCHI. By MERVIN C. MYERSON, M.D., New York City. A volume of 291 pages, with 89 illustrations. Published by Charles C Thomas, 220 E. Monroe St., Springfield, Ill. Price, $5.50.

RADIATION AND CLIMATIC THERAPY OF CHRONIC PULMONARY DISEASES, WITH SPECIAL REFERENCE TO NATURAL AND ARTIFICIAL HELIOTHERAPY, X-RAY THERAPY, AND CLIMATIC THERAPY OF CHRONIC PULMONARY DISEASES AND ALL FORMS OF TUBERCULOSIS. Edited by EDGAR MAYER, M.D., F.A.C.P., F.A.C.C.P., Assistant Professor of Clinical Medicine, Cornell University Medical College, New York City; Attending Physician New York and Memorial Hospitals; Special Pulmonary Consultant, New York State Department of Labor; Formerly Member Faculty Trudeau School for Tuberculosis; Director (ex urbe) Northwoods and Will Rogers Tuberculosis Sanatoria, Saranac Lake, New York; Consultant on Tuberculosis to the Government of Cuba; Board Member of the Finlay Institute of the Americas. With the Collaboration of the Following Contributors: Louis Beardslee Baldwin, Irvin I. Balensweig, Alfred Lee Briskman, William Chang, Anthony C. Cipollaro, William W. Coblentz, Lloyd F. Craver, Martin Dworkin, Earl C. Elkins, John N. Hayes, Ira I. Kaplan, H. Haig Kasabach, Eugene Kisch, Frank H. Krusen, Henry Laurens, Maurice Lenz, Horace LoGrasso, Harriet C. McIntosh, Clarence A. Mills, Leroy S. Peters, Homer L. Sampson, Stanley L. Wang. A volume of 393 pages, with 46 illustrations. Published by The Williams and Wilkins Company, Baltimore, 1944. Price $5.00.

C Bachrach

KARL KORNBLUM, M.D.
1893–1944

IN MEMORIAM

KARL KORNBLUM, M.D.

1893–1944

At dawn on May 16, 1944, death came to Karl Kornblum at the age of 51. Stricken abruptly, without premonition, at the height of his brilliant career, he died, within four days, just five years after his former chief, Henry K. Pancoast. This shocking tragedy leaves a place in radiology that will be difficult to fill.

Doctor Kornblum was born in Evansville, Indiana. He was graduated from the University of Indiana in 1916, and from the University of Pennsylvania Medical School, with honors, in 1919. He served as a member of the Interne Staff of the Hospital of the University of Pennsylvania until 1921. He then went into obstetrics and was Resident in Obstetrics for one year. Following this he was Instructor of Surgery in the School of Medicine of the University of Pennsylvania from 1922 to 1929, and was Chief of the Outpatient Department of Surgery during the years 1923 and 1924.

Doctor Kornblum then went into private practice, but he soon learned he was happier when associated with a teaching institution. He returned to the University of Pennsylvania, where he came under the tutelage of Doctor Pancoast, with whom he was associated until 1933. Doctor Kornblum's early training was invaluable to him, and to those with whom he worked, and it served him well in the specialty in which he finally decided to equip himself.

In 1934 Doctor Kornblum became Assistant Professor of Radiology in the Graduate School of Medicine of the University of Pennsylvania and Director of the Department of Radiology at the Graduate Hospital. He resigned from the Graduate School to accept the post of Professor of Radiology at Jefferson Medical College, which had been vacated by the death of Dr. Willis F. Manges. This chair he held from 1938 to 1942. He returned to the University of Pennsylvania in 1943 as Clinical Professor of Radiology and Associate in the Department of Radiology in the Hospital of the University of Pennsylvania, where he remained until his death.

In 1925 Dr. Kornblum married Miss Mabelle Edwards, who was a most sympathetic and devoted wife and in many ways assisted him in his work. They have two children, Joan, aged 16, and Ann, 14 years.

Doctor Kornblum was loved, respected, and admired by his associates, colleagues, and friends. He was a careful clinical investigator and published many articles on radiologic problems. At the time of his death he was busily engaged in preparing a monograph on the roentgen diagnosis of diseases of the head and sinuses, which was to have been published as one of the new series of handbooks on diagnosis by the Year Book Publishers. He was President of the Philadelphia Roentgen Ray Society in 1933–1934 and was a member of many other scientific societies, including the Radiological Society of North America.

It can be said of Karl Kornblum that he fully justified the confidence which teachers, colleagues, and friends entrusted to him. Those of us who have worked with him have lost a real friend, one who was a constant source of strength and inspiration.

EUGENE P. PENDERGRASS, M.D.

ROBERT WILLIAMS COOPER, M.D.

1898–1944

Dr. Robert W. Cooper died in Galveston, Texas, on March 13, 1944, after an illness of three months. Dr. Cooper was born in Durant, Miss., in 1898. He was graduated in medicine from the University of Pennsylvania in 1923, following which he entered upon general practice in Alton, Iowa. He then specialized in radiology, spending two and one half years in the Radiological Department of Louisiana State University, followed by a year in New York at the Memorial and Presbyterian Hospitals. He established himself in Shreveport in June 1940 and there practised radiology until his death. He was Radiologist for the Schumpert Sanitarium, the Shreveport Clinic, and the Charity Hospital.

Doctor Cooper was a diplomate of the American Board of Radiology and was a member of the American College of Radiology, the Radiological Society of North America, and the American Medical Association. He was President of the Shreveport Radiological Club.

On Nov. 27, 1926, Doctor Cooper married Mabel Matteson, of Au Claire, Wis. To this union three children were born, Robert Lee, now 16; George, 13; and Lynne, 7.

CLIFFORD P. RUTLEDGE, M.D.

WILLIAM McDOWELL DOUGHTY, M.D.

1881–1944

The Lord saw fit to loan this world William McDowell Doughty from Nov. 4, 1881, to April 18, 1944. During this comparatively short period he was the recipient of many honors, accomplished much, and in payment gave more of himself than he received. He had the faculty of making friends, and to him the making of a friend was a thing accomplished. He was primarily a doctor, secondarily a specialist in radiology. He was considerate

WILLIAM McDOWELL DOUGHTY, M.D.
1881–1944

of his associates, and was at all times able to consider agreeably and weigh an opposing point of view.

The character of Doctor Doughty is best exemplified by two quotations which he jotted down: "The way to climb high is to remain on the level" and "Blessed is the man who, having nothing to say, abstains from giving evidence of that fact in words."

Doctor Doughty was born in Covington, Ky., and was graduated from the Miami Medical College, now the Medical College of the University of Cincinnati, in 1906. He served an eighteen months' internship in the Cincinnati General Hospital and did postgraduate work for one year in Vienna and London.

Among the honors which Doctor Doughty received were the following: President of the American Roentgen Ray Society; Fellow of the American College of Surgeons; Fellow of the American College of Radiology; President of the staff of The Christ Hospital and Director of Radiology in The Christ Hospital, Cincinnati; President of the Cincinnati Academy of Medicine; Member of the Board of Directors of the University of Cincinnati and Associate Professor of Radiology in that institution; Director of Radiology in the Children's Hospital, Cincinnati. He was a member of the American Medical Association, a member of the Radiological Society of North America, a diplomate of the American Board of Radiology, and a member of the Silicosis Board of Referees of the Industrial Commission of Ohio.

No better epitaph may be written of him than this: "God made him—and smiled!"

E. R. BADER, M.D.

RADIOLOGICAL SOCIETIES OF NORTH AMERICA

Editor's Note.—Will secretaries of societies please cooperate by sending information to Howard P. Doub, M.D., Editor, Henry Ford Hospital, Detroit 2, Mich.

UNITED STATES

Radiological Society of North America.—Secretary, D. S. Childs, M.D., 607 Medical Arts Building, Syracuse 2, N. Y.

American Roentgen Ray Society.—Secretary, Harold Dabney Kerr, M.D., Iowa City, Iowa.

American College of Radiology.—Secretary, Mac F. Cahal, 540 N. Michigan Ave., Chicago 11, Ill.

Section on Radiology, American Medical Association.—Secretary, J. T. Murphy, M.D., 421 Michigan St., Toledo 2, Ohio.

ARKANSAS

Arkansas Radiological Society.—Secretary, J. S. Wilson M.D., Monticello. Meets every three months and annually at meeting of State Medical Society.

CALIFORNIA

California Medical Association, Section on Radiology.—Secretary, Earl R. Miller, M.D., University of California Hospital, San Francisco, Calif.

Los Angeles County Medical Association, Radiological Section.—Secretary, Roy W. Johnson, M.D., 1407 South Hope St., Los Angeles. Meets second Wednesday of each month at County Society Building.

Pacific Roentgen Society.—Secretary, L. Henry Garland, M.D., 450 Sutter St., San Francisco. Meets annually during meeting of California Medical Association.

San Diego Roentgen Society.—Secretary, Henry L. Jaffe, M.D., Naval Hospital, Balboa Park, Calif. Meets first Wednesday of each month.

San Francisco Radiological Society.—Secretary, Martha Mottram, M.D., Suite 1789, 450 Sutter St., San Francisco. Meets monthly on third Thursday at 7:45 P.M., in Toland Hall, University of California Hospital, from January to June; at Lane Hall, Stanford University Hospital, July to December.

COLORADO

Denver Radiological Club.—Secretary, A. Page Jackson, Jr., M.D., 304 Republic Bldg., Denver 2. Meetings third Friday of each month at the Denver Athletic Club.

CONNECTICUT

Connecticut State Medical Society, Section on Radiology.—Secretary, Max Climan, M.D., 242 Trumbull St., Hartford 3. Meetings bimonthly, second Thursday.

FLORIDA

Florida Radiological Society.—Secretary-Treasurer, Charles M. Gray, 306 Citizens Bldg., Tampa 2.

GEORGIA

Georgia Radiological Society.—Secretary-Treasurer, James J. Clark, M.D., 478 Peachtree St., N. E., Atlanta 3. Meetings twice annually, in November and at the annual meeting of State Medical Association.

ILLINOIS

Chicago Roentgen Society.—Secretary, Warren W. Furey, M.D., 7144 Jeffery Ave., Chicago 49. Meets at the Palmer House, second Thursday of October, November, January, February, March, and April.

Illinois Radiological Society.—Secretary-Treasurer, William DeHollander, M.D., St. Johns' Hospital, Springfield. Meetings quarterly by announcement.

Illinois State Medical Society, Section on Radiology.—Secretary, Fay H. Squire, M.D., 1753 W. Congress St., Chicago 12.

INDIANA

The Indiana Roentgen Society.—Secretary-Treasurer, Harold C. Ochsner, M.D., Methodist Hospital, Indianapolis 7. Annual meeting in May.

IOWA

The Iowa X-ray Club.—Holds luncheon and business meeting during annual session of Iowa State Medical Society.

KENTUCKY

Kentucky Radiological Society.—Secretary-Treasurer, Sydney E. Johnson, M.D., Louisville City Hospital, Louisville. Meeting annually in Louisville, third Saturday afternoon in April.

LOUISIANA

Louisiana Radiological Society.—Secretary-Treasurer, Johnson R. Anderson, M.D., North Louisiana Sanitarium, Shreveport. Meets annually at same time as State Medical Society.

Shreveport Radiological Club.—Secretary-Treasurer, R. W. Cooper, 940 Margaret Place. Meetings monthly on the second Wednesday, at the offices of the various members.

MARYLAND

Baltimore City Medical Society, Radiological Section.—Secretary, Walter L. Kilby, M.D., 101 W. Read St., Baltimore 1. Meets third Tuesday of each month.

MICHIGAN

Detroit X-ray and Radium Society.—Secretary-Treasurer, E. R. Witwer, M.D., Harper Hospital, Detroit 1. Meetings first Thursday of each month from October to May, inclusive, at Wayne County Medical Society club rooms, 4421 Woodward Ave., Detroit.

Michigan Association of Roentgenologists.—Secretary-Treasurer, E. M. Shebesta, M.D., 1429 David Whitney Bldg., Detroit. Meetings quarterly by announcement.

MINNESOTA

Minnesota Radiological Society.—Secretary, A. J. Stenstrom, M.D., Minneapolis General Hospital, Minneapolis 26. Meetings quarterly.

MISSOURI

Radiological Society of Greater Kansas City.—Secretary, Arthur B. Smith, M.D., 306 E. 12th St., Kansas City, Mo. Meetings last Thursday of each month.

The St. Louis Society of Radiologists.—Secretary, E. W. Spinzig, M.D., 2646 Potomac St. Meets on fourth Wednesday of each month except June, July, August, and September, at a place designated by the president.

NEBRASKA

Nebraska Radiological Society.—Secretary, F. L. Simonds, M.D., 1216 Medical Arts Bldg., Omaha 2. Meetings third Wednesday of each month at 6 P.M. in either Omaha or Lincoln.

NEW ENGLAND

New England Roentgen Ray Society (Maine, New Hampshire, Vermont, Massachusetts, and Rhode Island).—*Secretary,* Hugh F. Hare, M.D., Lahey Clinic, Boston 15, Mass. Meets monthly on third Friday at Boston Medical Library.

NEW JERSEY

Radiological Society of New Jersey.—Secretary, H. J. Perlberg, M.D., Trust Co. of New Jersey Bldg., Jersey City. Meetings at Atlantic City at time of State Medical Society and midwinter in Newark as called by president.

NEW YORK

Associated Radiologists of New York, Inc.,—Secretary, William J. Francis, M.D., 210 Fifth Ave., New York City. Regular meetings the first Monday evening of the month in March, May, October, and December.

Brooklyn Roentgen Ray Society.—Secretary-Treasurer, Leo Harrington, M.D., 880 Ocean Ave., Brooklyn 26. Meets fourth Tuesday of every month, October to April.

Buffalo Radiological Society.—Secretary-Treasurer, Joseph S. Gianfranceschi, M.D., 610 Niagara St., Buffalo 1. Meetings second Monday evening each month. October to May, inclusive.

Central New York Roentgen Ray Society.—Secretary-Treasurer, Carlton F. Potter, M.D., 425 Waverly Ave., Syracuse 10. Meetings are held in January, May, and October, as called by Executive Committee.

Long Island Radiological Society.—Secretary, Marcus Wiener, M.D., 1430 48th St., Brooklyn 19. Meetings fourth Thursday evening each month at Kings County Medical Bldg.

New York Roentgen Society.—Secretary, Ramsay Spillman, M.D., 115 E. 61st St., New York 21, N. Y.

Rochester Roentgen-ray Society.—Secretary, Murray P. George, M.D., 260 Crittenden Blvd., Rochester 7. Meetings at convenience of committee.

NORTH CAROLINA

Radiological Society of North Carolina.—Secretary-Treasurer, Major I. Fleming, M.D., 404 Falls Road, Rocky Mount. Meeting with State meeting in May, and meeting in October.

NORTH DAKOTA

North Dakota Radiological Society.—Secretary, L. A. Nash, M.D., St. John's Hospital, Fargo. Meetings by announcement.

OHIO

Ohio Radiological Society.—Secretary, J. E. McCarthy, M.D., 707 Race St., Cincinnati 2. Next meeting will be held at the time and place of the annual meeting of the Ohio State Medical Association.

Cleveland Radiological Society.—Secretary-Treasurer, Don D. Brannan, M.D., 11311 Shaker Blvd., Cleveland 4. Meetings at 6:30 P.M. on fourth Monday of each month from October to April, inclusive.

Radiological Society of the Academy of Medicine (Cincinnati Roentgenologists).—*Secretary-Treasurer,* Samuel Brown, M.D., 707 Race St., Cincinnati 2. Meetings held third Tuesday of each month.

PENNSYLVANIA

Pennsylvania Radiological Society.—Secretary-Treasurer, L. E. Wurster, M.D., 416 Pine St., Williamsport 8. The Society meets annually.

The Philadelphia Roentgen Ray Society.—Secretary, Robert P. Barden, M.D., 3400 Spruce St., Philadelphia 4. Meetings held first Thursday of each month at 8:15 P.M., from October to May, in Thomson Hall, College of Physicians, 21 S. 22nd St., Philadelphia.

The Pittsburgh Roentgen Society.—Secretary-Treasurer, Reuben G. Alley, M.D., 4800 Friendship Ave., Pittsburgh 24, Pa. Meetings are held on the second Wednesday of each month at 4:30 P.M., from October to June, at the Pittsburgh Academy of Medicine, 322 N. Craig St.

ROCKY MOUNTAIN STATES

Rocky Mountain Radiological Society (North Dakota, South Dakota, Nebraska, Kansas, Texas, Wyoming, Montana, Colorado, Idaho, Utah, New Mexico).—*Secretary,* A. M. Popma, M.D., 220 North First St., Boise, Idaho.

SOUTH CAROLINA

South Carolina X-ray Society.—Secretary-Treasurer, Robert B. Taft, M.D., 103 Rutledge Ave., Charleston 16. Meeting in Charleston on first Thursday in November, also at time and place of South Carolina State Medical Association.

TENNESSEE

Memphis Roentgen Club.—Chairmanship rotates monthly in alphabetical order. Meetings second Tuesday of each month at University Center.

Tennessee Radiological Society.—Secretary-Treasurer, J. Marsh Frère, M.D., 707 Walnut St., Chattanooga. Meeting annually with State Medical Society in April.

TEXAS

Texas Radiological Society.—Secretary-Treasurer, Herman Klapproth M.D., Sherman.

VIRGINIA

Virginia Radiological Society.—Secretary, E. Latané Flanagan, M.D., 215 Medical Arts Bldg., Richmond 19.

WASHINGTON

Washington State Radiological Society.—Secretary-Treasurer, Thomas Carlile, M.D., 1115 Terry Ave., Seattle. Meetings fourth Monday of each month, October through May, at College Club, Seattle.

WISCONSIN

Milwaukee Roentgen Ray Society.—Secretary-Treasurer, C. A. H. Fortier, M.D., 231 W. Wisconsin Ave., Milwaukee 3. Meets monthly on second Monday at the University Club.

Radiological Section of the Wisconsin State Medical Society.—Secretary, Russell F. Wilson, M.D., Beloit Municipal Hospital, Beloit. Two-day annual meeting in May and one day in connection with annual meeting of State Medical Society, in September.

University of Wisconsin Radiological Conference.—Secretary, E. A. Pohle, M.D., 1300 University Ave., Madison 6, Wis. Meets every Thursday from 4 to 5 P.M., Room 301, Service Memorial Institute.

CANADA

La Société Canadienne-Française d'Electrologie et de Radiologie Médicales.—General Secretary, Origène Dufresne, M.D., Institut du Radium, Montreal. Meetings are held the third Saturday of each month, generally at the Radium Institute, 4120 East Ontario Street, Montreal; sometimes, at homes of members.

CUBA

Sociedad de Radiología y Fisioterapia de Cuba.—Offices in Hospital Mercedes, Havana. Meetings are held monthly.

ABSTRACTS OF CURRENT LITERATURE

ROENTGEN DIAGNOSIS

The Head and Neck

The Chest

The Digestive System

The Spleen

The Skeletal System

The Genito-Urinary Tract

Venography

RADIOTHERAPY

Neoplasms

Non-Neoplastic Disease

Effects of Radiation

THE HEAD AND NECK

An Encephalographic Ratio for Estimating the Size of the Cerebral Ventricles. Further Experience with Serial Observations. William A. Evans, Jr. Am. J. Dis. Child. **64:** 820–830, November 1942.

In a previous communication (Arch. Neurol. & Psychiat. **47:** 931, 1942. Abst. in Radiology **40:** 206, 1943) an encephalographic ratio was proposed for estimating the size of the cerebral ventricles and degree of atrophy of the brain. The ratio was obtained by dividing the transverse diameter of the anterior horns by the maximum internal diameter of the skull. Ratios between 0.25 and 0.30 were thought to represent borderline enlargement and those above 0.30 a pathologic ventricular dilatation. Further studies have been carried out to test the influence of some technical factors and common clinical procedures on the measurements used in the ratio, and serial examinations have been undertaken to determine the effect of varying quantities of air in the ventricles and other factors on the constancy of the ratio in the same subject.

Ideally, the roentgen exposure should be made in the anteroposterior projection in the sagittal plane, with the ray vertical and with the head held with the occiput down, so that a vertical line will pass through the outer canthus of the eye and the external auditory meatus. Moderate degrees of obliquity of the skull, however, in the sagittal and coronal planes were found to produce no significant or constant change in the measurements.

Many subjects show no change in measurements at three and at twenty-four hours after air injection, but in the majority there is a tendency for the ventricles to increase slightly in size in the presence of air. Ventricular dilatation is not reduced by spinal tap or influenced by the intravenous injection of hypertonic solutions. The dilatation is much more pronounced in the presence of an active diffuse cerebral lesion, in which case a rapid and irreversible dilatation of the ventricles may occur.

It is recommended that serial measurements be made for forty-eight or seventy-two hours in pneumoencephalography. If no change in measurements occurs, the presumption is that any diffuse cerebral lesion which may be present is "fixed." If the ventricles enlarge, this is presumptive evidence that the lesion is active and progressive. The rate of enlargement seems to be proportional to the degree of "softening" of the brain.

Nine cases are reported.

Hypertelorism. Alfred B. Berkove. Arch Otolaryng. **38:** 587–589, December 1943.

A case of hypertelorism occurring in a soldier is reported. Roentgenograms, showing an enlargement of the lesser wings of the sphenoid bone and increased width between the optic foramina, are reproduced.

Mucocele of the Frontal Sinus. Report of Five Cases in Two of Which at Operation the Mucocele Was Found to Be Empty. W. J. McNally, E. A. Stuart, and A. E. Childe. Arch. Otolaryng. **38:** 574–586, December 1943.

Five cases of mucocele of the frontal sinus are reported. This condition must be differentiated from cystic dilatation of the lacrimal sac, tumor, and abscess within the orbit, tumor of the frontal bone, epidermoid cyst, meningocele, meningioma, and hydatid cyst of the frontal sinus. Roentgenograms are of great assistance in the diagnosis. A mucocele tends to produce dilatation of the whole or of some portion of the involved frontal sinus, and if it enlarges sufficiently, it may also involve the opposite frontal sinus. The resulting cavity, as a rule, is smooth-walled, with a slightly whitened margin, and is relatively radiotransparent. The bony septa ordinarily present in the frontal sinus are usually obliterated. Thinning and bulging of the bony walls may occur, and defects may be present, especially in the floor.

Mucocele involving the frontal sinus calls for adequate and permanent drainage, which can be obtained only by an external operation. In two of the authors' cases the mucocele was found to be empty at operation. There is, however, no clinical method of determining that such is the case preoperatively.

Roentgenograms are reproduced.

Ectodermal Dysplasia (Anhidrotic Type) with Complete Anodontia. A Serial Roentgenographic Cephalometric Appraisal. Allan G. Brodie and Bernard G. Sarnat. Am. J. Dis. Child. **64:** 1046–1054, December 1942.

A case of ectodermal dysplasia of the anhidrotic type is presented. The patient was first seen at the age of 1 year and 9 months, with complete anodontia, sparse distribution of lanugo-like hair, absence of eyebrows and eyelashes, a pronounced wrinkling of the skin in the orbital area, a lack of normal prominence of the bridge of the nose, and eversion of the lower lip. Microscopic examination of the skin failed to show the presence of sweat glands, sebaceous glands, or hair follicles.

In order to determine the development of the face and jaws, lateral skull roentgenograms were taken at six-month intervals up to the age of 5 years and 4 months and were compared with those of 20 normal white boys during a corresponding period of growth. Analysis of the roentgenograms showed the patient to be within the lower limits of normal and to be growing at a normal rate. This was further substantiated by anthropometric measurements and by roentgen examination of the carpal bones. The author concludes that complete absence of teeth does not significantly impair development of the face and jaws.

THE CHEST

Annular Shadows of Unusual Type Associated with Acute Pulmonary Infection. L. R. Sante and C. E. Hufford. Am. J. Roentgenol. **50:** 719–730, December 1943.

In recent years a number of cases have been observed in which annular shadows of unusual character appeared in chest roentgenograms of patients with acute pulmonary infection. Clinically, the disease had its onset with evidences of infection, such as a sore throat, mastoiditis, or arthritis, with a rapidly developing systemic infection associated with chills and high fever and leukocytosis. Blood cultures were positive, showing streptococci, or *Staphylococcus aureus*, or some other type of pyogenic organism. Within a few days

after the onset of acute symptoms, multiple nodules, usually rounded, appeared simultaneously throughout both lung fields. These varied in size from 0.5 to 6.0 cm. in diameter and at first usually appeared solid. Central rarefaction rapidly converted them into annular shadows of unusual variety, having walls 2.0 to 5.0 cm. in thickness. In some the rarefaction was not uniform, but in others complete destruction of the center of the nodule resulted in fluid, which showed as a distinct fluid level. For the most part, however, the centers were filled with air, with little infiltrative reaction in the surrounding lung tissues. In most instances the lesions remain for several days or weeks and then gradually disappear. In one case, the ring-like structures persisted for over a year; in another, some became adherent to the pleura, forming localized areas of empyema which had to be drained by operative procedure. Only one patient died. The postmortem study on this patient suggested that thrombosis of the blood vessels played a part in the development of these annular structures, possibly thrombosis of bronchial arteries.

The lesions do not resemble acute pyogenic abscesses in that their outer margins are rounded and smooth, their walls are of uniform thickness, and they lack the surrounding infiltration common to acute lung abscess. They do not resemble infarcts of ordinary type either in shape or location and differ from ordinary emphysematous pleural blebs in that they apparently originate as solid nodular structures which break down and liquefy. Five case reports with accompanying roentgenograms are included. L. W. PAUL, M.D.

Roentgenographic Aspects of Monaldi's Cavity Aspiration in Pulmonary Tuberculosis. W. R. Oechsli and Edward Kupka. Am. J. Roentgenol. **50:** 733–742, December 1943.

Aspiration of a tuberculous cavity by suction through a catheter introduced transthoracically is one of the newer surgical procedures used to bring about obliteration of the cavity. It was originally worked out by Monaldi. The roentgenographic aspects of this procedure are discussed on the basis of a series of cases observed at Olive View Sanatorium (California). Accurate localization of the cavity is essential for the operation. This may be done by Johnson's method of localization (Am. J. Surg. **8:** 1237, 1930), by roentgenoscopic examination, by body section roentgenography, or by lateral films. At the time of puncture of the cavity the patient is examined roentgenoscopically in the supine position and the cavity again localized in relation to the ribs of the anterior chest wall.

Following the application of negative suction, the most dramatic change as seen in roentgenograms made a few days to a week after puncture is a very rapid decrease in the size of the cavity. This occurred in about half of the 17 cases on which this report is based. This favorable response was seen chiefly in those patients whose cavity had ballooned shortly before puncture. Along with this decrease in size, cavities lost he appearance of being under tension. After the initial decrease, further diminution in most cases was much slower. In the majority of patients there was increase in density around the cavity, most noticeable above and lateral to it, with eventual gradual clearing or absorption except for well defined evidence of thickening of the pleura which had not been present before aspiration.

In order to determine cavity closure, body section roentgenography was found essential. This procedure also was necessary for the determination of the presence and size of the tract between the cavity and anterior chest wall through which the drainage catheter was inserted.

The most prompt results were obtained when the cavities were of the balloon type and the poorest in those cases with considerable caseous involvement in the walls of the cavity. L. W. PAUL, M.D.

The Miniature Camera in Medicine. F. Birkinshaw. New Zealand M. J. **42:** 253–255, December 1943.

The author discusses the miniature camera and enumerates some of its advantages and disadvantages. He concludes that the 4 × 5-inch film approximates the ideal more nearly than the 35-mm. film. In 1940, 100,000 recruits in the Australian Army had their chests examined, at an average cost of between five and six pence, which covered the cost of all films, miniature and 14 × 17 inch, as well as processing and salaries. In this group 1.04 per cent showed roentgen evidences of tuberculosis; in 0.56 per cent the disease was considered to be active. HENRY K. TAYLOR, M.D.

Contrast Examination in Primary Carcinoma of the Lung. S. Di Rienzo. Rev. argentino-norteamericana de cien. med. **1:** 430–459, August 1943.

The author classifies the bronchographic images of carcinoma of the lung as lacunar defects, narrowing of the bronchus, and total obstruction. A large number of illustrations, well reproduced, illustrate his paper and a lengthy bibliography is appended.

Obstructive Emphysema and Atelectasis in the Same Lung Resulting from Bronchogenic Carcinoma. Abraham G. Cohen. J. Thoracic Surg. **12:** 714–718, December 1943.

The literature contains scanty reference to carcinoma of the bronchus causing obstructive emphysema. Atelectasis, however, resulting from a tumor is very common. The author reports a case of carcinoma of the right lung in which, after the introduction of a pneumothorax, the upper and middle lobes collapsed and the lower lobe became emphysematous. This was verified at operation, when the entire lung was removed. Examination of the specimen showed the tumor so situated as to occlude the lumen of the bronchi to the upper and middle lobes but only partially close the bronchus to the lower lobe.

HAROLD O. PETERSON, M.D.

Pulmonary and Intestinal Changes in Strongyloidiasis. J. Edward Berk, Marston T. Woodruff, and Alexander W. Frediani. Gastroenterology **1:** 1100–1111, December 1943.

Strongyloidiasis is primarily a disease of warm climates; in temperate zones it is encountered only occasionally. The migration of workers from the southern United States to the industrial war centers of the north and east and the return of men who have completed military service in tropical climates will probably bring about a wide dispersal of the disease. In patients infected with *Strongyloides stercoralis* pulmonary changes may occur which mimic tuberculosis and other diseases of the lungs. Confusing intestinal abnormalities may also be encountered.

Strongyloides stercoralis is a round worm with both a free-living and a parasitic phase of growth. The free-living phase of development takes place in the soil. The fertilized female discharges partially embryonated ova which mature in a few hours and develop into the first stage or rhabditiform larvae, which feed on organic débris in the soil and grow in turn into free-living adults. Under favorable conditions the free-living phase may continue indefinitely. When conditions become unfavorable, the rhabditiform larvae metamorphose into the second stage or filariform larvae, capable of invading the skin of human beings. Once in the skin many of them penetrate to the small blood vessels, through which they gain entrance into the blood stream and are then carried to the lungs. Here the larvae break out of the pulmonary capillaries into the alveoli, where they develop through postfilariform and preadolescent stages into adolescent worms. Fertilization of the adolescent females may occur in the bronchi. The majority of the worms pass up the respiratory tree to the epiglottis, are swallowed, and pass through the stomach to the small intestine. If insemination has not already occurred in the bronchi or trachea, it does so in the intestine. The fertilized females burrow into the mucosa, mature, and begin to deposit eggs. The eggs hatch in the tissues and the rhabditiform larvae then work their way into the lumen of the bowel, where they mingle in the intestinal current and are discharged in the stool. In some patients infected with *Strongyloides* internal autoinfection or so-called hyperinfection takes place. If fecal matter containing viable rhabditiform larvae is deposited on the peri-anal skin and remains for several hours, the larvae may metamorphose *in situ* into infective filariform larvae which then invade the skin. In the presence of constipation the first stage larvae may be retained long enough in the bowel to permit their transformation into second stage forms which are capable of invading the mucosa of the lower bowel.

The migration of the filariform larvae from the capillaries into the pulmonary alveoli is accompanied by hemorrhage of variable degree. At times a patchy pneumonitis with consolidation of various lobules develops, resulting from a combination of the mechanical effects of rupture of the alveolar walls and a cellular reaction to which secondary bacterial invasion may or may not be added. During the early stage of active infection with *Strongyloides*, a polymorphonuclear leukocytosis and eosinophilia are characteristic in the peripheral blood. In addition to the acute response, chronic inflammatory changes may follow the lodgment of adult worms in the bronchial and probably the tracheal epithelium.

The great majority of the parasites enter the duodenum and jejunum, but all levels of the intestine may be invaded. The ova and young larvae in the intestinal wall produce a low-grade inflammation in the mucosa and, in great numbers, may cause an unusual degree of destruction of tissue and a great deal of inflammatory exudate. Mucosal ulcerations not uncommonly occur as a result of necrosis and sloughing.

If strongyloidiasis is as prevalent as recent surveys indicate, then some patients must be suffering from acute and chronic pulmonary disease due to infestation with *Strongyloides stercoralis* which is mistakenly attributed to something else. This possibility should be given consideration whenever transient pulmonary infiltrations for which there is no obvious explanation are discovered on roentgen examination. When the infiltrations are associated with an eosinophilia, strongyloidiasis ought especially to be borne in mind. Parasitic disease of the nature of strongyloidiasis should be suspected whenever dyspnea, cough, or hemoptysis occurs in a person who also complains of abdominal pain, diarrhea, or other digestive tract difficulties.

Diarrhea and abdominal pain are common features of intestinal strongyloidiasis. It is to be anticipated that x-ray examination of the small intestine would in many cases reveal abnormalities in contour, pattern, and motility. In the chronic stages of the disease, when cellular infiltration is marked and fibroblastic deposition is prominent, the formation of granulomatous tumor-like lesions would appear to be a possibility. The authors, however, were unable to find any x-ray studies of this disease.

Two cases of strongyloidiasis are reported. Both patients had pulmonary symptoms and signs prior to their coming under the authors' observation and tuberculosis had been suspected. While it cannot be definitely stated that the lung changes were corporate parts of the strongyloidiasis, the authors believe this possibility exists. In both instances, also, roentgen examination revealed small intestinal abnormalities which it is plausible to consider as related in some way to the parasitic infestation.

Atypical Pneumonia Complicating Severe Varicella in an Adult. L. E. Rausch, T. J. Grable, and J. H. Musser. New Orleans M. & S. J. **96:** 271–275, December 1943.

A physician with varicella complicated by laryngeal spasm showed no abnormal chest findings twenty-four hours after the onset of the disease. Two days later, however, a diffuse bronchopneumonic type of infiltration was demonstrable throughout both lung fields. Clinical improvement followed immediately after the institution of sulfathiazole therapy, and a roentgenogram on the fifth day of the illness showed almost complete resolution of the lesion. In the absence of adequate proof of a specific agent the authors classify this as a case of "atypical" pneumonia in spite of the favorable response to sulfathiazole.

HENRY K. TAYLOR, M.D.

Lead Buttons for Intrapulmonary Localization. Edward F. Skinner. J. Thoracic Surg. **12:** 754–757, December 1943.

For aid in the localization of pulmonary abscesses or cavities, two metal buttons made of lead or zinc are cut about 1.0 cm. in diameter and 1.0 mm. in thickness. These have different shapes. The patient is examined with the fluoroscope, and a mark is made on the skin in front and in back over the abscess to be localized. Under procaine anesthesia locally, the metal buttons are sewed to the skin at the marks in such a way that, after stereoscopic roentgenograms are made, the metal markers can be cut off, leaving the sutures tied in the skin. The cavities are then localized with respect to the lead buttons by studying the roentgenograms stereoscopically. The ease with which the abscess or cavity can be located by a needle and syringe when guided by the buttons greatly facilitates the surgeon's work. The method has been used successfully in about 25 cases.

HAROLD O. PETERSON, M.D.

Newer Concepts in the Diagnosis of Congenital Heart Disease. Marcy L. Sussman, Arthur Grishman, and Morris F. Steinberg. Am. J. Dis. Child. **65:** 922–936, June 1943.

In the past four years the authors have studied upward of 80 cases of congenital heart disease both clinically and angiocardiographically. They believe that visualization of the cardiac chambers during life, after the intravenous injection of 70 per cent diodrast, has permitted a more accurate analysis of the cardiac contours and a clearer understanding of the disturbed cardiac physiology than were available previously. While they would not exaggerate the value of roentgen examination, they have used roentgenographic features as a basis of their classification of congenital lesions. They list four main groups.

1. Enlarged pulmonary artery segment of the cardiac contour: The pulmonary artery segment may appear prominent roentgenologically in the following congenital defects: (*a*) atrial septal defect; (*b*) patent ductus arteriosus; (*c*) isolated pulmonic stenosis with dilated pulmonary artery; (*d*) idiopathic dilatation of the pulmonary artery; (*e*) Eisenmenger's complex.
2. Normal or small pulmonary artery segment with (A) right ventricular enlargement and with (B) left ventricular enlargement: The congenital lesions which fall into the first of these categories are: (*a*) isolated pulmonic stenosis with a small pulmonary artery; (*b*) tetralogy of Fallot; (*c*) cor biatriatum triloculare; (*d*) transposition of the great vessels with small pulmonary artery. The second group includes (*a*) coarctation of the aorta; (*b*) atypical coarctation of the aorta with absence of the left radial pulse; (*c*) aortic or subaortic stenosis; (*d*) patent ductus arteriosus without dilatation of the pulmonary artery; (*e*) idiopathic hypertrophy; (*f*) isolated interventricular septal defect.
3. Persistence of the right aortic arch.
4. Dextrocardia with or without transposition of the viscera (situs inversus).

Under each of these headings the authors discuss the physical signs, circulatory dynamics, and electrocardiographic findings, as well as the angiocardiographic aspects, the correlation of which will usually permit an accurate diagnosis of the predominant lesion.

Evaluation of Roentgen Studies in Heart Disease in Children. Sol P. Ditkowsky and Edwin Rypins. Illinois M. J. **84:** 367–372, December 1943.

Examination of the heart in 532 children at the Illinois Soldier's and Sailor's Children's School was made by means of roentgenographic, fluoroscopic, electrocardiographic, and stethographic studies. Changes in cardiac contour were classified according to the standard nomenclature of the American Heart Association.

Thirty-nine per cent of the group, or 208 children, showed abnormalities of cardiac contour. Of these, 78 showed mitral configuration, 108 showed left ventricular enlargement, 16 had enlargement of the pulmonary conus, and 6 had globular configuration. All of the last two groups had systolic murmurs. In the other two groups there were 4 with no physical findings and 3 with apparent functional murmurs, the remainder having various organic murmurs. Three hundred and twenty-five children showed no roentgen abnormalities. Of these, 139 showed no abnormal findings clinically; 62 had murmurs which were probably functional, and the remainder probable organic murmurs. Only 8 per cent (21 cases) of the 225 patients with evidence of mitral disease showed deviation of the esophagus.

Summarizing their observations, the authors state that abnormal cardiac contour is evidence of cardiac disease, though the latter may exist without such roentgen changes. Roentgen studies are an important aid in diagnosis, as the typical auscultatory findings may be absent or overlooked.

Case histories, illustrated with x-ray reproductions, are presented, showing the value of repeated roentgen examinations of the heart in evaluating the status of a convalescent patient.

LESTER M. J. FREEDMAN, M.D.

Coarctation of the Aorta in Childhood. Review of the Literature and Report of Three Cases. Paul H. Rhodes and Edgar Durbin. Am. J. Dis. Child. **64:** 1073–1096, December 1942.

A review of the literature on coarctation of the aorta revealed 47 cases in which the adult or "compensating" type had been diagnosed during life in children under fifteen years of age.

When coarctation of the aorta is pronounced enough to give clinical signs, its diagnosis is not difficult if the condition is kept in mind. It should be suspected when forceful pulsations in the neck and hypertension, particularly with a wide pulse pressure, are observed in a child. The presence of a much lower blood pressure in the legs and of retardation and diminution of pulsation in the femoral arteries confirms the diagnosis. The finding of a collateral circulation and the roentgenologic signs are valuable aids. Fray (Am. J. Roentgenol. **24:** 349, 1930) considered a defect in the aortic arch seen in the left postero-anterior oblique film the most reliable roentgen sign of coarctation in the adult. In young children, however, it is frequently difficult to outline the aortic arch. The authors found that it often can be seen best in a film taken midway between the left postero-anterior oblique and the lateral position. Hypertrophy of the left ventricle, dilatation of the ascending aorta, and erosion of the lower margin of the ribs are indirect signs. Erosion if present is considered pathognomonic of coarctation, but its absence does not rule out the condition.

If routine determinations of blood pressure in children are made on only one arm, the right arm should be used, in order to avoid overlooking the occasional cases of coarctation in which the pressure is low in the left arm. Such a case is reported in a nine-year-old boy, with two other cases of coarctation of the aorta of the adult type in children of eleven months and four years, respectively.

It is important to diagnose coarctation as early in childhood as possible, since the life of the patient may be prolonged by avoidance of strenuous sports and occupations.

Nonsyphilitic Aneurysm of the Aorta in Individuals Under 45 Years of Age. M. F. Steinberg, A. Grishman, and M. L. Sussman. J. Thoracic Surg. **12:** 704–713, December 1943.

Aneurysm of the thoracic aorta is usually due to either syphilis or atherosclerosis. Syphilis is more common as the cause in patients under forty-five years of age and atheroma in the older groups. The authors report four cases, reproducing roentgenograms of each, of nonsyphilitic aneurysms in patients less than forty-

five. Two were located just beyond the arch, one in the posterior part of the arch, one in the innominate artery. In one case the aneurysm was located and was verified by angiocardiography and exploration. It was treated by wiring and electrocoagulation. One was considered to be a traction aneurysm at the site of the ductus arteriosus. This case was also verified by angiocardiography and exploration. The aneurysm of the innominate was verified by exploration and postmortem examination. Angiography in this case was of no help in the diagnosis. One case was verified by angiocardiography only.

HAROLD O. PETERSON, M.D.

THE DIGESTIVE SYSTEM

Dyspepsia: An Investigation. Harold Edwards and W. S. C. Copeman. Brit. M. J. **2:** 640–642, Nov. 20, 1943.

The authors introduce this discussion with the statement that dyspepsia is one of the most important of the many problems that confront a populace during wartime.

In a 30-bed ward 436 dyspepsia patients were seen in one year. Complete diagnostic procedures were recorded and classifications were set up. There were 217 non-ulcer and 139 ulcer cases. The remaining 80 cases were not included in the report. Of the 217 patients without ulcer, 180 showed no physical disease and in the remaining 23 the diagnosis was usually gastritis or duodenitis.

In the investigation of the non-ulcer group the following conclusions were reached. Civilian occupation, marital status, and war service are not significant from the standpoint of causation. The average duration of a case of non-ulcer dyspepsia is six years, and the family history is suggestive. Eating and drinking habits are of doubtful significance. Pain has a more apparent relation to food and sleep in ulcer cases than in non-ulcer dyspepsia. Cases of both types are relieved by alkalis.

The authors seem to regard the x-ray findings as of primary importance but have no use for the term "duodenitis". The gastroscope is employed in all radiologically negative cases. Q. B. CORAY, M.D.

Immersion Blast Injuries of the Abdomen. D. R. Webster, A. S. Ross, and E. L. Alford. Canad. M. A. J. **49:** 1–4, July 1943.

The authors report their observations on 15 survivors of a torpedoed ship who sustained abdominal injuries from an exploding depth charge while in the water. The men were at varying distances from the ship—some still alongside and others 150 feet distant. Almost all turned to watch the ship as it went down, thus facing in the direction of the explosion, the depth of which is placed at 150 feet. All stated that they felt as if they had been struck a tremendous blow in the abdomen. The majority had only moderate abdominal pain in the first few hours after the accident, but shortly after being rescued, all experienced severe pain and vomiting, the vomitus in several instances containing blood and bile. Distention occurred in 5 and almost all had rigidity of the abdominal wall at some time. Blood counts varied from 11,000 to 30,000.

Four patients died, one on the first day, one on the second, one on the fifth, and one six weeks later. Four had protracted periods of convalescence and still had mild symptoms five months after the injury. Histories of these 8 cases are included. Seven recovered rapidly without surgical intervention and were discharged from the hospital in three to fourteen days.

There was almost complete absence of chest symptoms, probably because of the protection afforded by the kapok life preservers which were worn. It is suggested that it might be well to extend these life preservers so that they cover the abdomen.

In the four cases with protracted convalescence, in which the white count and sedimentation rate remained elevated, accompanied by fever and loss of weight, abdominal pain, tenderness and rigidity, but without physical signs of abscess formation, it is the authors' opinion that a low-grade inflammatory process was present in the bowel wall or peritoneal cavity.

The authors point out that submucosal and petechial hemorrhages interfering with the neuromuscular mechanism could produce ileus. They believe that within twelve hours it should be decided which cases require operative interference, and doubtful cases should have the benefit of a laparotomy.

M. L. CONNELLY, M.D.

Effect of Anemia on Gastric Emptying. Leon O. Jacobson and Walter Lincoln Palmer. Gastroenterology **1:** 1133–1140, December 1943.

A study of gastric emptying in anemia was made in an attempt to determine whether or not the apparent relationship between anemia, gastric emptying, and symptoms is coincidental or real. Observations were made on 15 patients with pernicious anemia in relapse, the same patients after return of the blood count to normal following therapy, and an equal number of patients with pernicious anemia under control for months to years. Normal medical students and patients with moderate to severe anemias, the etiology and pathogenesis of which are not fully understood, were used as controls.

Having had nothing by mouth since midnight, the patient was given 4 c.c. of a barium sulfate drink (33 per cent barium by volume) between 8 and 9 A.M. The material was taken within a period of five minutes and fluoroscopic examination was made at once and at intervals thereafter until the stomach had entirely emptied or only traces of barium remained. Fluoroscopy was done with the patient standing, facing the examiner, with the back directly against the fluoroscopic cabinet and the fluoroscopic screen directly in contact with the abdomen. Sketches of the stomach and duodenum were made on the screen by means of a colored wax pencil with each examination in all patients; the rate of passage of the medium through the small bowel was noted in seven. The sketches were later transferred to paper and subsequent sketches upon the same patient were superimposed on the original for comparison.

Contrary to the general belief that gastro-intestinal motility is increased and the passage of material from the stomach and through the intestinal tract is accelerated in pernicious anemia, these functions were found either to be normal or delayed in severely anemic persons in relapse. With one exception, significant prolongation of the emptying time was observed in those patients with a peripheral erythrocyte count below 1,500,000. A similar observation was made in the anemias of obscure etiology. The gastric emptying time in the normal students and in the patients with pernicious

anemia under treatment and in full remission varied from two to four hours. In 6 of the 15 patients with pernicious anemia in relapse the emptying time exceeded four hours, averaging six and a half hours. In all of these, when the anemia disappeared under treatment, the emptying time returned to normal, the average being reduced from six and a half to two and seven tenths hours. No consistent relationship between the degree of abdominal symptomatology, the type or severity of the anemia, and the emptying time appeared to exist, although the majority of the patients with prolonged gastric emptying did have abdominal symptoms of varying severity. The impression that patients with pernicious anemia in relapse or remission are subject to attacks of diarrhea perhaps accounts for the prevalence of the opinion that gastro-intestinal motility is increased, with consequent rapid emptying. In no instance in the achlorhydric group was gastric emptying found to be more rapid than in the normal controls.

Peptic Ulcer and Chronic Gastritis. Vincent P. Collins. Ann. Surg. **118:** 1005–1014, December 1943.

The term chronic gastritis has been applied by the clinician, the pathologist, the radiologist, and the gastroscopist to a wide variety of conditions in which the elements of inflammation, congestion, edema, and cellular infiltration are predominant. In an attempt at clarification the author reviews the findings in 213 stomachs resected for various conditions.

A detailed microscopic study of these specimens revealed a number of changes in the gastric glands which at first appeared to be of little significance, but when arrayed in a sequence of increasing severity formed an uninterrupted series of lesions suggesting a single disease process, to which the term chronic gastritis seems applicable. The minimal lesions consisted of scattered glands lined by epithelial cells undifferentiated into chief and parietal cells. Scattered glands were also observed undergoing a process of vacuolar degeneration which was occasionally found to have progressed to so complete a degree that only the ghost of the gland persisted. These changes were believed to be compatible with a normal process of degeneration and repair in gastric mucosa. The process of degeneration is sometimes associated with an infiltration by polymorphonuclear leukocytes. This may involve a number of adjacent glands and amount to a focus of necrosis which may border on focal ulceration of the mucous membrane.

The minimal lesions recognizable grossly are focal ulcerations involving the mucosa, which in the healed state are identifiable as a network of shallow fissures with intervening mounds of mucosa, presenting a pebbled or umbilicated appearance. The even progress of this series of ulcerated and healed lesions is maintained by ulcerations or scars which may extend through the muscularis mucosae to the submucosa, and to or even through the muscular coat.

When the degeneration and the necrosis are overwhelming and the mechanism of repair is inadequate, a recognizable peptic ulcer is the result. The peptic ulcer is thus only the most obvious manifestation of chronic gastritis and symptoms of peptic ulcer may be present without the gross lesion.

Hypertrophic gastritis is considered to be a mechanical alteration in the gastric mucosa, but atrophic gastritis is an integral and late stage of chronic gastritis.

G. A. CREEL, M.D.

Ulcer in the Descending Duodenum. Chauncey N. Borman. Am. J. Roentgenol. **50:** 752–764, December 1943.

The small number of reported cases of ulcer in the descending duodenum diagnosed by roentgen examination compared to the necropsy incidence suggests that in many instances these ulcers may have been overlooked. The author reports 7 cases recently seen by him of active ulcer in the upper descending duodenum, all demonstrated roentgenologically. In each instance the location of the crater was on the upper and inner margin of the descending duodenum just below the superior flexure. Secondary spasm, mucosal distortion, and medial retraction of the adjacent upper descending duodenum were present in all cases. In 3 instances the location of the crater was confirmed by surgical inspection. Macroscopic hemorrhage occurred in 6 of the 7 cases and nocturnal pain was prominent in 4. The roentgen differential diagnosis must take into consideration diverticula, cancer, visualized ampulla of Vater, and duodenitis. Detection of the niche is the important factor in establishing a diagnosis of active ulceration. Illustrative roentgenograms and three case reports are included.

L. W. PAUL, M.D.

Carcinoma of the Duodenum. J. W. Howard. Am. J. M. Sc. **206:** 735–746, December 1943.

Carcinoma of the duodenum was found to account for 37 per cent of the cancers of the small bowel reported in the literature, as against 35 per cent in the jejunum and 28 per cent in the ileum. The periampullary portion is the most frequent site.

Carcinomas of the duodenum probably do not arise from duodenal ulcers and are seldom associated with polyposis. Hyperplastic or neoplastic involvement of Brunner's glands is rare and probably has no bearing on the etiology.

The stenosing type of tumor, which usually infiltrates the submucosa and tends to encircle the lumen, is the most frequent type. Ulceration and scarring are common. Carcinoma of the papilla, on the other hand, usually involves only a portion of the intestinal wall. In general, metastases are late and chiefly involve the regional lymph nodes before other adjacent structures are invaded.

This disease occurs more often in males, the average age falling in the sixth decade. In the majority of cases the tumor is quite large when discovered, since symptoms are uncommon as long as the lumen of the bowel is adequate. Vague epigastric distress, with occasional attacks of pain, anorexia, and loss of weight are usually present. There is usually a moderate to marked anemia, perhaps due to ulceration, since occult blood in the stools is a rather consistent finding. Jaundice is rare, even with involvement of the periampullary region, except as a terminal event. Obstruction of the bowel may occur as the lesion progresses.

The x-ray examination has been positive in less than half of the cases reported. Depending on the stage of the disease and the amount of the deformity, the following findings may be expected: (1) dilatation and vigorous reverse peristalsis when the tumor produces obstruction; (2) filling defect or, more commonly, an irregular constriction, frequently resembling an ulcer.

Several patients have survived following operation.

Three cases which came to autopsy are reported.

BENJAMIN COPLEMAN, M.D.

Small Intestinal Enema. Richard Schatzki. Am. J. Roentgenol. **50:** 743–750, December 1943.

The author describes a method for examination of the small intestine which has been found to be of value in the diagnosis of lesions involving that part of the gastro-intestinal tract. It consists in the introduction of a soft rubber tube into the duodenum through the mouth. When the tip of the tube has reached the duodenum a thin barium and water mixture is injected. This consists of one glass of the usual barium mixture diluted with two glasses of lukewarm water. The mixture is allowed to flow by gravity and 500 to 1,000 c.c. are necessary for examination of the entire small bowel. Reflux into the stomach sometimes occurs and may occasionally be quite disturbing. Filling of the bowel is observed roentgenoscopically, with intermittent observations, until the entire small intestine has been completely filled. The earliest filling of the cecum occurred in five minutes. In most pathologic cases, considerably more time was required, the average being thirty-seven minutes in 19 checked cases. Constant flow of the enema fluid is necessary, and any interruption will delay the examination markedly.

With this method it is possible to study the entire small intestine within a relatively short space of time. Actual filling of the various loops can be observed roentgenoscopically and small lesions of various types can be recognized more readily than with the conventional procedure. Contraindications include marked mechanical or paralytic ileus, suspected gangrene of the bowel, and active duodenal ulcer.

The author credits Pesquera (Am. J. Roentgenol. **22:** 254, 1929. Abst. in Radiology **14:** 435, 1930) with first recommending the use of the duodenal tube for continuous filling of the small intestine for the purposes of roentgen examination. L. W. PAUL, M.D.

Volvulus of the Sigmoid Colon; Discussion of Combined Volvulus and Hepatodiaphragmatic Interposition. J. G. Probstein and H. R. Senturia. Surg., Gynec. & Obst. **77:** 669–672, December 1943.

The authors report 2 cases of volvulus of the sigmoid colon, one of which was associated with hepatodiaphragmatic interposition of the colon.

The first patient was a 32-year-old white male who was admitted three times within six months with a typical picture of intestinal obstruction. On two of these admissions the colon was found to be above the liver radiographically. On the first admission operation was carried out, with reduction of the volvulus. On the second, conservative measures were used and the obstruction was overcome. The third time the patient consented to resection of the redundant sigmoid loop. The second patient, a 26-year-old white male, was admitted twice within a year, each time presenting a picture of intestinal obstruction. The first attack was relieved by operation, with reduction of the volvulus and replacement of the bowel. The second attack was relieved by resection of the redundant sigmoid. Resection was followed in each instance by a normal course.

The authors point out that hepatodiaphragmatic interposition of the colon is usually an incidental finding which must be differentiated from air under the diaphragm due to perforation of a viscus. Volvulus of the sigmoid occurs in patients with a long redundant sigmoid colon and is more common in Russia than in this country. Immediate resection of the loop is recommended, because of the possibility of recurrence.

The roentgenograms illustrating this article are only fair reproductions. JOHN O. LAFFERTY, M.D.

Polypoid Lesions of the Colon of Children. Roger L. J. Kennedy, Claude F. Dixon, and Harry M. Weber. Surg., Gynec. & Obst. **77:** 639–644, December 1943.

The authors report the experience of the Mayo Clinic with 11 cases of polypoid lesions of the colon in children. The patients were from 3 to 14 years of age, and included 4 girls and 7 boys. Symptoms had been present for variable periods from a week to seven years. The most common symptom was blood in the stools, usually small in amount and on the outside of the stool or at the end. In only one case was bleeding severe enough to require transfusion. Pain and diarrhea were not common.

There are hree important points in the diagnosis of these polypoid lesions. First, the history is important and characteristic. The blood is fresh and is not mixed with the stool. There is no diarrhea. Second, in 6 of the 11 cases polypoid lesions were present in the rectum and were revealed by proctosigmoidoscopy. The third method of diagnosis is the roentgen examination.

The authors describe roentgen examination of the colon in children as follows: The colon is thoroughly cleansed by purgative drugs, of which castor oil in doses ranging from 15 to 30 c.c. is preferred, followed by a simple enema of physiologic salt solution on the morning of the examination. The barium enema should be given under fluoroscopic control, and the patient palpated and rotated so that all parts may be studied. At the completion of the examination the patient should empty the bowel; the contents should not be siphoned off. Not more than five minutes should be allowed for evacuation, as the barium suspension will be dehydrated and the material will collect in clumps. The patient is then insufflated with air and stereoscopic roentgenograms are made. The authors use suspending agents with the enema and give pentobarbital sodium in doses of 0.75 to 1.5 grains if the children are difficult to handle.

The treatment of these lesions is transcolonic excision or resection of the involved segment, the procedure depending on their extent. These polyps are usually adenocarcinomas of low-grade malignancy according to the classification of Broders, though a few are simple adenomas.

The results in this series of cases have been good.

JOHN O. LAFFERTY, M.D.

Neurofibromatosis of the Colon, Small Intestine and Mesentery in a Child. Thomas Chalkley and James W. Bruce. Am. J. Dis. Child. **64:** 888–894, November 1942.

A case of neurofibromatosis of the colon, small intestine, and mesentery in a child is presented. A negro girl, age 8, was admitted to the hospital, with an infection of the upper respiratory tract. At that time there was found an asymptomatic, irregular, nontender, hard, freely movable mass extending from the umbilicus laterally for 12 cm. It was not fixed to the skin and seemed to be a part of the intestine. Roentgenograms of the gastro-intestinal tract showed narrowing of the terminal portion of the ileum, which was irregular in contour and moderately fixed. The cecal tip was irregular, and the whole picture was characteristic of a terminal ileitis. A barium enema showed no

abnormalities except the condition in the cecum. Intravenous pyelograms showed prompt and satisfactory output of the dye into both renal pelves. There was a congenital anomaly of both kidneys, consisting of a bifid pelvis on the left side and on the right a double kidney and a double ureter, which extended down to the level of the fourth lumbar vertebra. At this point there was apparently an obstruction, causing a hydroureter.

A complete resection of the colon with the terminal 2 feet (60 cm.) of the ileum and the involved mesentery was done. The pathologic diagnosis was neurofibromatosis of the colon, cecum, small intestine and mesentery. At the time of this report, the child was doing well. There was no familial history of neurofibromatosis.

Pheniodol: A New Contrast Medium for Cholecystography. F. H. Kemp. Brit. M. J. **2:** 674–676, Nov. 27, 1943.

Pheniodol is the name applied to the various British preparations of the cholecystographic medium introduced by Dohrn and Diedrich in Germany, where it is known as Biliselectan [manufactured in America as Priodax]. The author's observations on this new medium, as prepared by several different British drug houses, are closely in accord with the findings of American investigators (see papers by Bryan and Pedersen, Paul and Pohle, and Hefke in Radiology **42:** 224, 226, 233, March 1944). It was found to produce shadows similar in density and filling to those obtained with tetraiodophenolphthalein. Though some patients complained of a disagreeable taste, the new medium was less objectionable to take than the older one. It seldom caused vomiting and, though diarrhea followed its use in some instances, this occurred with no greater frequency than after tetraiodophenolphthalein.

The author includes a review of cholecystographic media beginning with the original studies of Graham, Cole, and Copher.

Gall Bladder Functions After Sub-Total Gastrectomy: Clinical and Roentgenological Observations. I. R. Jankelson and S. A. Robins. Am. J. Digest. Dis. **10:** 445–447, December 1943.

In order to determine the effect of partial gastrectomy upon the functions of the gallbladder, cholecystographic investigations were done on 15 patients upon whom this operation had been performed. None of these patients had a diseased gallbladder at the time of operation. The gallbladder filled normally in all but one case; there was delayed emptying in two cases. The authors have observed in their clinical work four cases of cholelithiasis in patients who have had a partial gastrectomy in whom no evidence of gallbladder disease was found at operation. From the study of this small group of cases, they conclude that subtotal gastrectomy may interfere with the normal function of the gallbladder leading to infection or gallstone formation.

JOSEPH T. DANZER, M.D.

THE SPLEEN

Solitary Calcified Cyst of the Spleen. P. O. Snoke. Am. J. M. Sc. **206:** 726–730, December 1943.

The author reports a solitary calcified cyst of the spleen in a 60-year-old white woman who was slightly icteric. The large area of calcification noted in the roentgenogram was said to have been absent in an examination made two years before. It is thought that the cyst may have been hemorrhagic in origin, and the calcification recent.

Only 5 other cases have been reported in the literature. The age incidence is not restricted to any one group. Four of the patients have been women. The roentgenographic appearance is very difficult to differentiate from that of a calcified aneurysm of the splenic artery.

BENJAMIN COPLEMAN, M.D.

THE SKELETAL SYSTEM

Paget's Disease of Bone (with Report of Case). James Miller. Canad. M. A. J. **49:** 13–16, July 1943.

There appear to be two forms of Paget's disease, the common monostotic form, involving one bone of the skeleton, and the rare polyostotic variety, involving several bones. Osteitis deformans, the term suggested by Paget, is somewhat misleading, as the pathological changes do not suggest an inflammatory process.

The disease is one of later life and seems to be more common in males. In America it is reported more often in the northern states. Paget stated that the disease is not associated with mental trouble. In his series of cases no hereditary tendency was found. The author, however, presents a case with a familial history.

According to Paget, the long bones of the lower extremity and the skull are most frequently involved. The bones increase in length and thickness; they are heavier than normal, and the bone is more vascular, more porous, and softer.

Microscopically the earliest change is the appearance of osteoclasts or multinucleated bone cells which hollow out and remove normal bone. The bone and intervening marrow are replaced by fibrous tissue and while some bony trabeculae are being removed by osteoclasts new ones are laid down by osteoblasts. This new bone is composed of alternate denser and less dense layers, giving a mosaic structure when stained with hematoxylin, a condition found in no other disease.

Radiographically, the early finding is an osteoporosis; later there is the appearance of new bone replacing the old. There are two forms of this new bone, spongy and amorphous, the former being more common.

Of associated conditions, arteriosclerosis appears to be most constant, usually of the Mönckeberg type. There appears also to be a definite association between Paget's disease and malignant neoplasia, the bone dystrophy being the earlier condition.

The only chemical test of value, according to Jaffe, is determination of the serum phosphatase, which is frequently twenty times the normal. This test is not specific, however, as high values are also reported in osteitis fibrosis cystica.

M. L. CONNELLY, M.D.

Late Rickets. Elizabeth Brakeley. Am. J. Dis. Child. **65:** 314–319, February 1943.

A case of late rickets in a girl of 11 years is reported. The patient's development was retarded; she did not walk or talk until she was three years old. She had been treated for gonorrheal vaginitis and marasmus and had received several series of antisyphilitic treatments. At the age of ten, she was seen in the outpatient department because of a waddling gait. A roentgenogram of the pelvis on that occasion was normal.

In June 1936, at the age of 11, the patient was again

seen because of swelling and tenderness of the knees and ankles. Roentgenograms of the extremities showed florid rickets, with cupping and saucer-shaped appearance and some increased density of the diaphyses. There was a slight hypochromic anemia. The calcium content of the serum was 11.2 mg. per 100 c.c., and the phosphorus content was 3.29 mg. A twin brother showed no signs of rickets.

The patient remained in the hospital for three and a half months and received large doses of vitamin D, up to 4 c.c. of viosterol in oil (40,000 U.S.P. units of the vitamin) a day, and ultraviolet ray treatment. Roentgenograms taken in September 1936, June 1937, and January 1938 showed healed rickets. The child continued, however, to show extreme decalcification of the bones, a high serum calcium level, a low level of serum phosphorus and a high serum phosphatase level. This was attributed to hyperparathyroidism secondary to the rickets, but operation (March 1939) failed to reveal any parathyroids. Since permission for a second exploratory operation was refused, it was decided to use roentgen therapy and in November 1939, 800 r was administered to the right side of the neck, followed three weeks later by 800 r to the left side. Examination of the blood in January 1940 revealed definite improvement and roentgenograms taken in February 1940 showed a moderate increase in cortical density of the tibia, fibula, radius, and ulna. In June 1940 the serum calcium was again elevated and the serum phosphorus decreased. The neck was irradiated twice, with the same dosage as before. In October 1940 the calcium level was the lowest since the condition was recognized. A roentgenogram of the extremities showed that, while there was still some evidence of osteoporosis in all the long bones, there was a considerable increase in the thickness and density of the cortex throughout. At the time of this report, the patient felt well, had no pain in her knees, and walked without difficulty.

Intractable Hypophosphatemic Rickets with Renal Glycosuria and Acidosis (the Fanconi Syndrome): Report of a Case in Which Increased Urinary Organic Acids Were Detected and Identified, with a Review of the Literature. D. J. McCune, H. H. Mason, and H. T. Clarke. Am. J. Dis. Child. **65:** 81–146, January 1943.

The present report, under the heading Progress in Pediatrics, describes a case of severe hypophosphatemic rickets in a 9-year-old boy, associated with renal glycosuria and extreme reduction of the bicarbonate in the serum. Although moderate polyuria, albuminuria, and cylindruria were detected, the non-protein nitrogen and urea were normal. The urine was acid and contained exaggerated amounts of ammonia and organic acids. Of these 82 per cent were amino acids, 11 per cent lactic acid, and 7 per cent betahydroxybutyric acid. Slight reduction of fixed base and sodium in the serum was demonstrated. A balance study revealed excessive excretion of phosphorus and calcium by the kidneys. The metabolism of sodium, chlorine, and magnesium appeared to be unaffected. Treatment with 5,000 U.S.P. units of vitamin D daily for several weeks had no obvious effect; other therapeutic recommendations were not carried out. The patient died at the age of 10 years and 1 month; no autopsy was performed.

The data are interpreted to indicate diminished ability of the renal tubular epithelium to resorb dextrose, amino acids, and phosphate from the glomerular filtrate. Inasmuch as the requirement of cation to neutralize the organic acids was not met by the production of a highly acid urine, large amounts of ammonia and increased urinary volume, mineral cations of the body fluids were called on, with resultant depletion of fixed base. Recurrent hypoglycemia was thought to be responsible for the excretion of betahydroxybutyric acid. The presence of lactic acid was ascribed hypothetically to either renal tubular or hepatic dyscrasia.

The literature of the last fifteen years contains references to or detailed descriptions of 28 cases which are comparable with the foregoing so far as they are characterized by rickets and renal glycosuria, and 2 cases in which rickets was replaced by osteoporosis in adults.

A review of the literature supports the concept of the central role of the kidneys in the pathogenesis of the Fanconi syndrome and of allied disorders; interpretation of the significance of the hepatic damage which some patients exhibit requires further evidence. However, critical examination of the data of this case and of others which have been reported indicates that renal tubular resorption of phosphorus is more seriously compromised than that of cation. This distinction has an important bearing on treatment. Finally, it is apparent that the Fanconi syndrome, with its combination of rickets, hypophosphatemia, and renal glycosuria, is not a sharply definable clinical entity. On the contrary, it appears to be one phase, or aspect, of a larger morbid species and merges without perceptible demarcation on the one side with classic hyperphosphatemic renal rickets and on the other with the poorly understood process which is currently called cystine rickets.

Abstracts of previously reported cases of the Fanconi syndrome and allied disorders are included.

Osteochondrosis Deformans Tibiae. Nonrachitic Bow Leg in Children. C. Glenn Barber. Am. J. Dis. Child. **64:** 831–839, November 1942.

Osteochondrosis of the medial tibial condyle is the most common cause of development of bow leg during childhood in localities where rickets due to vitamin D deficiency is seldom seen. Many times the true condition is unrecognized and, although the children have received adequate amounts of vitamin D and although other evidence of rickets is wanting, the deformities of the legs are attributed to that disease.

The changes observed in osteochondrosis of the medial tibial condyle are definite and need not be confused with those seen in rickets, whether due to deficiency of vitamin D or of the renal or the colonic variety, nor should they be confused with the deformities which may accompany dyschondroplasia, achondroplasia, fragilitas ossium, or osteogenesis imperfecta.

The roentgenographic and pathologic changes are like those of coxa plana and those in the many bones similarly involved. When the tibial condyles are involved, two distinct types occur. These two types are dependent on the age at which the condition becomes manifest and have been designated as the infantile and adolescent types of the disease "tibia vara." Gradually increasing bowing occurs, without apparent cause and without the other symptoms of rickets. The deformity is likely to appear bilaterally in the infantile type, frequently with subsequent spontaneous disap-

pearance of the bow leg on one side. In the adolescent type the angulation usually occurs on one side only. There is a limp if the condition is unilateral and a waddle if it is bilateral. There is an abrupt angulation with the apex laterally just below the knee joint, but in fat children this appears to be a gradual curve. When the deformity appears during infancy, enlargement of the medial condyle is palpable on physical examination and visible in the roentgenogram. Recurvation at the knee and relative flatfoot are present, irrespective of age. Abnormal mobility of the knee on medial strain with normal stability on lateral strain and inward rotation of the tibia on the femur are constantly observed. The roentgenographic and pathologic changes are like those of coxa plana and similar to those of dyschondroplasia but quite different from those of rickets. Faulty growth of the upper tibial epiphyseal cartilage and delayed ossification of its medial half result in a wedge-shaped deformity of this portion. The adolescent type looks different in the roentgenogram. It appears as an arrest of growth rather than a dysplasia. The roentgenographic features of the infantile type gradually change to those of the adolescent type so that the two can be distinguished later only by the history.

Treatment of osteochondrosis deformans tibiae depends on the stage of the disease. Measures to prevent further deformity or to correct existing deformity have proved effective during the plastic stage. When deformity is disabling or unsightly after the osteochondrosis has become arrested, tibial osteotomy is advisable.

Monocytic Leukemia Associated with Bone Changes. Robert J. Kositchek. Ann. Int. Med. **19:** 1008–1013, December 1943.

A 19-year-old boy with monocytic leukemia complained of pain and limitation of motion in the right arm and shoulder and pain and weakness in both hips and thighs. He experienced difficulty in walking and the gait is described as shuffling and spastic. Roentgen examination showed osteolytic lesions in the surgical neck of the right humerus, involving the medullary portion of the bone; less extensive changes, possibly due to osteoporosis, in the upper third of the femur; osteoclastic changes in the right clavicle and in the surgical neck and head of the left humerus. Stereoscopic studies of the pelvis revealed circular areas of bone destruction in each ischium and about the right acetabulum. Similar changes were seen in the head, neck, and inter-trochanteric region of each femur. In the skull were several rounded areas of translucency representing bone destruction in the parietal region bilaterally. A similar area was seen in the inferior portion of the parietal bone anteriorly, just above the squamous portion of the temporal bone.

Roentgen therapy to the extremities resulted in relief of pain and the gait became normal. Death occurred a few months later but autopsy was not obtained.

This case, as far as could be ascertained, is the first in the literature of an associated monocytic leukemia and bone absorption. The softening and absorption in the medullary portion of many of the long bones, the increased porosity produced by widening of the haversian canals, and the cystic changes which may be indicative of neoplastic invasion have been noted in cases of lymphocytic and myelogenous leukemia, but are new to monocytic leukemia as a clinical entity.

The relief which was given to the patient by roentgen-ray therapy over the painful extremities leads to the suggestion that roentgenographic studies should be undertaken in cases of monocytic leukemia with painful bony areas. STEPHEN N. TAGER, M.D.

Gaucher's Disease. Samuel Levine and Leon Solis-Cohen. Am. J. Roentgenol. **50:** 765–769, December 1943.

Two cases of Gaucher's disease are reported, one showing typical bony changes and the other several atypical findings. In the first instance, roentgenograms of the lower ends of the femurs showed the typical Erlenmeyer flask deformity. In the other case there were multiple areas of punctate osteolysis symmetrically distributed throughout the shaft of the humerus on either side and scattered isolated osteolytic areas in many of the other long bones but with an absence of the Erlenmeyer flask appearance in the lower ends of the femora. The skull showed minute areas of bone absorption in the frontal and parietal region. The diagnosis of Gaucher's disease in this case was proved only after bone biopsy. L. W. PAUL, M.D.

Pseudocongenital Dislocation of the Hip in Infants. Joseph H. Lapin. Arch. Pediat. **40:** 649–652, December 1943.

The author deals here with the borderline case in which clinical findings may hint at a beginning hip dislocation but the roentgenogram is negative. Among the clinical findings which have been stressed are: lack of symmetry as compared with the normal leg and unsymmetrical transverse creases. The term "potential dislocation" has been applied to cases in which the angle formed by the acetabular shelf with the horizontal plane is increased. This angle the author discusses with a note of caution. Though some advocate orthopedic management in all children in whom the angle exceeds 30 degrees, such patients have been known to escape dislocation without treatment.

Three cases are reported. In the first, there was definite asymmetry of the legs and transverse creases were observable on the left leg but not on the right. Roentgenography, however, definitely ruled out any type of dislocation or predislocation. The second patient, a child of seventeen months, walked with a waddle, with the right foot everted almost at a right angle, and had an apparent shortening of the right leg. The sole of the shoe on the affected side was raised and a hobble skirt employed; six months later, the gait had improved, though lack of symmetry was still evident. In the third case only elevation of the sole was resorted to, with a marked improvement after six months.

PERCY J. DELANO, M.D.

Subluxation of the Ankle. G. F. Pennal. Canad. M. A. J. **49:** 92–95, August 1943.

This is a report of a series of 14 cases of subluxation of the ankle, the term subluxation being used to designate "injuries resulting in a complete tear of the external lateral ligament of the ankle with subsequent momentary or recurrent outward dislocation of the astragalus, unaccompanied by fracture."

The author discusses the anatomy of the external lateral ligament of the ankle and presents roentgenograms illustrating results of various types of injury to this ligament.

Differentiation between a subluxation and a simple sprain may be made from an anteroposterior roentgenogram taken with the foot held strongly in inversion. In normal ankles and in the presence of a simple sprain there is no tilting of the astragalus; with subluxation various stages of tilting are demonstrable, from the minor tilt with rupture of only the anterior fasciculus to the more common picture of subluxation associated with complete rupture of both fasciculi.

Treatment successfully used in this series was prolonged immobilization (ten weeks) in a walking plaster cast. Strapping alone is inadequate.

M. L. CONNELLY, M.D.

Ruptured Ligaments of the Ankle. A Roentgen Sign. R. P. Ball and E. W. Egbert. Am. J. Roentgenol. **50:** 770–771, December 1943.

A spread of the tibio-fibular ankle mortise from torn ligaments may produce a permanently unstable ankle joint unless properly treated. This condition may be diagnosed from routine roentgenograms of the ankle joint area. If the anteroposterior view is made with the foot in a true anatomical position, a clear space between the malleoli and the talus is not seen unless there is a spread of the tibio-fibular mortise; in normal cases, there will be an overlapping of the shadows of one of the malleoli upon the talus. This sign may not be present in all cases with injury to the ligament but, when found, is positive evidence of soft-tissue injury of clinical significance.

L. W. PAUL, M.D.

THE GENITO-URINARY TRACT

Intravenous Pyelograms in Normal and Abnormal Pregnancies. Deborah C. Leary and John P. Peters. Am. J. Obst. & Gynec. **46:** 803–809, December 1943.

The present study was undertaken to determine whether toxemia of pregnancy and urinary tract infection in pregnancy have any significant effect upon changes in the urinary tract generally accepted as physiologic. A group of 108 women in various stages of pregnancy and the puerperium were studied by intravenous pyelography. In 85 of these patients, pregnancy was in some way abnormal. Dilatation of the renal pelvis and dilatation, tortuosity, and lateral displacement of the ureter are listed as positive pyelographic findings. Cases with none of these changes are listed as negative.

Only 2 of the patients in the normal group were examined ante partum, and of these one is listed as showing positive (at 24 weeks) and one as showing negative findings (at 33 weeks). Of the abnormal group, 22 were studied ante partum and 16 gave positive findings (of the 6 with negative findings, 5 were examined before the 16th week). Post-partum examinations were made in 21 normal patients and 59 abnormal. In all but 6 of the normal group the observations were negative, indicating that regression of urinary tract changes is prompt in normal pregnancy. Of the abnormal group, on the contrary, 27 were positive and 32 negative. Neither the ante-partum or the post-partum studies showed any conclusive evidence that the degree of parity played a role.

Patients with urinary tract infection or pyelitis, as well as being included in the abnormal group, were tabulated separately. The trend evident in the abnormal series as a whole appeared to be exaggerated in the infected group.

In the entire series of 108 selected patients, one major and one minor urinary tract anomaly were found. One patient, otherwise normal, had bilateral polycystic kidneys. One patient with mild pre-eclampsia had a bifid pelvis and ureter on the right. In one patient with eclampsia, a calculus of the upper pole of the right kidney was discovered. In none of these was any evidence of infection present.

The authors conclude that urinary tract infection and toxemia enhance the normal tendency to dilatation of the urinary tract in pregnancy and interfere with the usual prompt regression of such changes.

STEPHEN N. TAGER, M.D.

Intravenous Urokymography. A Preliminary Report. Boland Hughes. J. Urol. **50:** 621–624, November 1943.

A kymogram records on one film the movement of definite points of the urinary tract through thirty seconds of time, and so depicts the actual dynamic function. In order to give sufficient contrast for the kymogram, retrograde filling of the urinary tract was necessary when this method of study was first introduced. The author, in collaboration with the x-ray department, devised an intravenous technic which gave satisfactory results, in contrast to earlier intravenous methods which were only occasionally successful.

From 20 to 30 c.c. of diodrast or neoiopax are injected, and the patient is kept in the Trendelenburg position for fifteen minutes. Just before the kymogram is made, a change is made to the flat position.

The kymograph consists of a large lead sheet in which narrow horizontal slits are cut 12 mm. apart, each slit being 0.4 mm. in width. This "grid" is stationary, and the film casette moves downward during a single continuous exposure of thirty seconds for a distance of 12 mm. There remains 0.2 mm. of unexposed film which shows up as a series of white horizontal lines. This is accomplished by having the x-ray exposure automatically stopped just before the film casette traverses the full 12 mm. distance. The x-ray exposure is made by a high capacity, rotating anode tube. The other factors are 30 inch S.T.D., 25 ma., 60–100 kv., 1 mm. Al filtration, 30-second exposure.

Sample urokymograms are included in the paper.

DAVID KIRSH, M.D.

Primary Sarcoma of the Ureter. Case Report and Review of the Literature. Lee Rademaker. Am. J. Surg. **62:** 402–406, December 1943.

A case of leiomyosarcoma of the ureter, the sixth case of primary ureteral sarcoma to be reported, is presented, with a review of the literature.

A white woman, aged 59, was admitted to the hospital, complaining of a heavy, dull ache in the upper left side of the abdomen, gas, and a lump in the side. The aching sensation had appeared about five months previously. The pain was at first intermittent and became progressively worse. One month before admission the patient noticed the presence of a mass, which felt like a ball. This had increased in size and had become very tender.

The abdomen was dome-shaped, with normal liver dullness. It was considerably distended with gas. A smooth, clearly defined mass, about the size of a large grapefruit, filled the left upper quadrant. This mass was not attached to the anterior abdominal wall and could be moved about 1 inch in all directions. It was very tender, especially at the upper pole. It could not

be palpated posteriorly and there was no posterior tenderness. Pressure on the mass caused a definite pulsation to occur, transmitted probably from the aorta. Physical findings were otherwise negative.

All films of the abdomen showed the outline of a rounded mass in the upper left quadrant. An intravenous pyelogram showed a moderate hydronephrosis on the left side. On several roentgenograms, the left ureter was seen to end abruptly within the tumor. On the right side there was a moderate ptosis of the kidney with some kinking of the ureter.

Removal of the tumor was accomplished readily though it was complicated by severe hemorrhage. The postoperative course was uneventful, and fourteen months after the operation the patient was without detectable recurrence or metastasis. The pathological diagnosis was leiomyosarcoma of the ureter. Interesting features of the growth were its relatively few symptoms, its large size without obvious metastasis, its good encapsulation, and its low index of malignancy

Cystourethrographic Diagnosis of Prostatic Disease. William E. Forsythe, Jr. Urol. & Cutan. Rev. **47:** 669–673, December 1943.

Because of the close relationship between the posterior urethra and the prostate, pathological changes in the latter will produce urethral deformities making possible a urethrographic diagnosis. Often more information can be obtained by cystourethrography than by cystoscopy and with less risk and discomfort.

The technic is as follows. After routine preparation an abdominal plain plate is taken. The bladder contents are then withdrawn through a No. 12F soft rubber catheter, and the patient is placed in an oblique position with the lower thigh flexed to about 45 degrees and the upper thigh extended. The x-ray tube is focused over the symphysis pubis, air is injected into the bladder, and a second exposure is made. The catheter is then withdrawn, the air being retained in the bladder by compression on the terminal portion of the penile urethra, and 20 c.c. of hippuran jelly mixture is slowly injected and a third film is taken. During the exposure an additional 10 c.c. of the jelly is injected. The patient is then replaced in the dorsal position, the catheter is reinserted, the bladder is irrigated, and a routine cystogram is made after the injection of sodium iodide.

In the normal subject the urethrogram shows the urethral catheter entering the bladder neck straight. The prostatic urethra measures 3–4 cm. in length and is spindle-shaped with slight narrowing at the external and internal sphincter sites. The cystogram reveals a smooth vesical outline with no filling defect at the vesical orifice. The departures from this picture to be seen in various lesions of the prostate are described and illustrative aerograms and urethrograms are reproduced. MAURICE D. SACHS, M.D.

VENOGRAPHY

Retrograde Venography of the Deep Leg Veins. J. C. Luke. Canad. M. A. J. **49:** 86–88, August 1943.

The author presents his technic for retrograde venography. The Bucky diaphragm is used for radiography of the thigh and an ordinary intensifying screen for the lower leg. Venipuncture of the femoral vein is performed just below the superior ramus of the pubis, the puncture being made just medial to the femoral artery. The artery and vein are compressed against the superior pubic ramus, and the injection is then made quite easily without pressure. With the assistant still exerting pressure on the artery and vein, radiographs are made of thigh and lower leg. The solutions used are perabrodil and diodrast, as these entail less chance of trouble if some is accidentally injected outside the vein. This technic was used in 29 cases with no untoward reaction.

The valvular mechanism of the femoral vein and its tributaries allows retrograde flow of contrast media down the vein even in a normal leg, in contrast to the saphenous vein, where normal valves resist high pressure when retrograde injection is attempted.

The main indication for retrograde venography is the determination of the presence or absence of a previous "silent" femoral phlebitis. In such a case there is no normal femoral channel, this being replaced by a tortuous mass of collaterals which take over the function of the partially or completely obliterated main vein.

A case is reported in a soldier who had symptoms referable to the legs after an attack of pneumonia. Venograms illustrative of this and 6 other cases are reproduced. M. L. CONNELLY, M.D.

RADIOTHERAPY

NEOPLASMS

Brocq-Belot's Technique in the Treatment of Superficial Skin Cancers. Paul Brodeur. Canad. M. A. J. **49:** 109–110, August 1943.

This is a report of 32 cases of superficial cancer of the skin in which the primary lesion was treated by the Brocq-Belot technic. Of these cases, 22 were epidermoid-cell carcinomas and the remainder were basal-cell carcinomas.

A brief résumé is given of the Brocq-Belot technic. In cases where there is marked infection the wound is disinfected for twenty-four hours by wet compresses, vaccines, etc. Under local anesthesia the lesion, together with a border about 0.5 cm. in width, is curetted. Immediately following this, roentgen therapy is applied—1,200 to 1,800 r in one sitting. Only rarely is more treatment necessary, but in exceptional instances a second dose one-half the size of the first may be given in four to six weeks. The factors used in the author's series were 85 kv.p., 5 ma., filtration (inherent) 0.5 mm. Al, target-skin distance 28 cm., H.V.L. 0.84 mm. Al. The rate was slightly over 100 r per minute.

The author's cases were treated between the years 1935 and 1941. The results as of the date of the report (January 1943) were as follows. Of 27 patients with Stage I cancers, 18 were alive and well, 7 had died of intercurrent disease but with no skin cancer, and 2 were untraced. The 3 patients with Stage II and the 2 with Stage III lesions were all alive and free of cancer. The Stage III cases received, in addition, x-ray therapy to involved nodes. M. L. CONNELLY, M.D.

Carcinoma of the Breast: Treatment and Late Results. N. Puente Duany, Rafael Canizares, and Ernesto Fonts Abreu. Rev. med. cubana. **54:** 882–892, October 1943.

Of a total of 602 patients with carcinoma of the breast, treated at the Radium Institute of Habana during the years 1924 to 1937 inclusive, 100 were found to be alive five years after treatment. Study of this group forms the basis for the opinions expressed in the present paper. The clinical diagnosis was in most instances confirmed histologically. In patients who applied for treatment after they had been operated upon elsewhere the diagnosis was established by recurrence or metastasis.

The bulk of the patients were treated by surgery followed by roentgen or radium irradiation. A greater number of five-year "cures" were found to follow this combined therapy.

Like other workers in this field, the writers found that certain factors show a beneficial influence on the outcome of treatment, as more advanced age of the patient, early diagnosis, non-existence of metastasis, and treatment by trained personnel with adequate equipment. On the other hand, a poor prognosis is suggested by a rapidly growing tumor, a young patient, especially if the growth developed during pregnancy or lactation, a high grade of malignancy, and existence of metastases. Twice as many five-year cures were obtained in patients with Grade 1 as in those with Grade 2 tumors.

The writers deplore the preference shown of late to the use of roentgen therapy over radium, especially in the treatment of axillary metastases and recurrences. They believe it is not justified. A. MAYORAL, M.D.

Carcinoma of the Thoracic Œsophagus. Some Notes on Its Pathology and Spread in Relation to Treatment. J. A. C. Fleming. Brit. J. Radiol. **16:** 212–216, July 1943.

Between 78 and 87 per cent of cancers of the thoracic esophagus are squamous epitheliomas. Practically all of the remainder are adenocarcinomas. There is usually a period of from six to nine months between the onset and the diagnosis. During this time extension to surrounding structures or metastasis usually occurs. Death ensues, on an average, five or six months after the diagnosis is made.

Autopsy studies on 42 cases showed metastasis in 83.5 per cent of lesions in the upper third; 71.5 per cent in the middle third, and 93.5 per cent in the lower third. In 54 per cent of the cases metastases were found in the mediastinal nodes; in 23 per cent in the abdominal nodes and in 4 per cent in the cervical nodes. The trachea and bronchi were involved in 25 per cent; the liver in 21 per cent; the lungs and pleura in 17 per cent; the stomach and adjacent viscera in 13.6 per cent; and other viscera in 6.7 per cent. Where the visible involvement of the esophagus exceeded 5 cm. in length, there was a material increase in distant metastases.

These figures indicate that there is very little chance of successful treatment of esophageal cancer by any method. There is only one proved example of a five-year survival following surgical removal, Torek's famous case. Only a few instances of successful treatment by radium are reported. The high percentage of metastasis would indicate that radium locally applied has little chance of being successful.

On physical and pathological grounds irradiating by x-ray appears to offer the best outlook. The author advocates many multiple narrow beams, varying the volume of tissue intensively treated with the probability of extension and the size of the primary growth. In a series of 21 cases so treated there was an apparent increase in the length of survival of between three and six months as compared with untreated cases.

SYDNEY J. HAWLEY, M.D.

Radiation Treatment of Cancer of the Cervix. Norman A. McCormick. Canad. M. A. J. **49:** 178–184, September 1943.

The first phase of treatment of carcinoma of the cervix was surgical. The second or radium phase developed as a natural sequence of unsatisfactory surgical experience. The third phase, consisting in the addition of adequate external roentgen irradiation to the use of radium, followed the realization that control of lymphatic involvement of the parametrium is the most important factor in the management of these cases.

As satisfactory means for the measurement of roentgen dosage have been developed, an improvement in the results has been observed. A technic of combined x-ray and radium therapy has been evolved, whereby it is possible to deliver a minimum of 5 to 8 skin-erythema doses throughout the pelvis.

Roentgen irradiation should precede radium therapy, the daily dose being kept small—150 to 200 r—so that the tumor bed will be unaltered. The diminution in the size of the growth—at times amounting to complete disappearance—following such treatment makes for ease and accuracy in radium application. Devitalization of the tumor also makes possible dilatation of the cervix with more impunity and less risk of cancer dissemination.

The author uses six portals encircling the pelvis and occasionally adds two gluteal portals. Two portals are treated daily, each receiving 150 r at first, increased within a week to 200 r (200 kv., 20 to 25 ma., 1 mm. Cu plus 4.0 mm. Al, target-skin distance 80 cm.). The average treatment time for each field is about twenty minutes. Each portal receives 2,000 r, making a total pelvic dose of 12,000 r (in air). The 80 cm. distance between skin and x-ray target, while a rather costly technic, requiring four times the treatment time of an exposure at 40 cm., results in a considerably greater depth dosage and is a very essential part of the treatment.

Radium therapy is instituted one or two days following completion of x-ray irradiation: 100 mg. of radium filtered by 1 mm. Pt, in a gum-elastic applicator, is placed with proper precautions in the uterine cavity and cervical canal and allowed to remain for 30 hours. A second application to the vault of the vagina a day or two later brings the total dose to 5,500 or 6,000 mg. hr.

The series reported here numbered 135, of whom 77 were treated more than three years earlier. Excluding 2 of this number who were treated prophylactically after operation and 8 who had recurrent lesions after treatment elsewhere, the author bases his analysis on 67 cases. Twenty-nine patients of this group, or 43 per cent, were alive and apparently cancer-free at the end of the three-year period. Of 35 patients treated as long ago as five years, 14, or 40 per cent, were alive and apparently well. These are absolute survival rates.

For further analysis by stages of the disease, reference must be made to the original paper.

M. L. CONNELLY, M.D.

Panhysterectomy versus Irradiation for Early Cancer of the Uterine Cervix. Howard W. Jones, Jr., and Georgeanna E. Seegar Jones. J. A. M. A. **122:** 930–932, July 31, 1943.

The authors compare the results of panhysterectomy in a carefully selected group of 36 cases of early carcinoma of the cervix with those in 704 unselected cases of all stages treated by irradiation. They found that, despite the careful selection, a five-year cure rate of only 41 per cent was obtained in the surgically treated group, which did not compare at all favorably with the rate of 57 per cent obtained in a similar, though generally less favorable, group treated by irradiation.

Although it is the opinion of many gynecologists and surgeons that operation is a satisfactory method of therapy for very early cervical carcinoma, the authors conclude that irradiation is the treatment of choice.

DEPARTMENT OF ROENTGENOLOGY
UNIVERSITY OF MICHIGAN (R. H. M.)

Further Experience in the Management and Treatment of Carcinoma of the Fundus of the Uterus, with Five-Year End Results in 75 Patients. Lewis C. Scheffey, Wm. J. Thudium, and David M. Farell. Am. J. Obst. & Gynec. **46:** 786–802, December 1943.

A consecutive series of 127 patients having carcinoma of the uterine fundus, seen between 1921 and 1942, were studied with respect to diagnosis and treatment. Only 20.5 per cent of the patients were below the age of fifty; 78.7 per cent had definitely passed the menopause; of the others, 7, over fifty years of age, gave a history of "irregular periods" which were evidently intermittent episodes of bleeding of organic and/or functional origin.

Irregular bleeding was the most frequent symptom, taking the form of menorrhagia and/or metrorrhagia in the premenopausal group of patients and of "spotting" in those past the menopause. The average duration of symptoms prior to diagnosis was eight to nine months in the premenopausal and twelve to thirteen months in the postmenopausal patients.

The authors consider curettage important for the diagnosis, and more and more are accompanying this with biopsy of the cervix and cervical canal. With patients of forty and over in whom there is a possibility of fundal carcinoma, especially if the gross appearance of the curetted material is suspicious, and providing the case is suitable on general principles for irradiation therapy, they insert radium (50 or 100 mg.) in the uterine cavity while waiting for a four-hour report on the curettings and, if necessary, on the biopsy material. If the condition proves to be benign, the case is treated accordingly. If a fundal carcinoma is present, adequate dosage is provided, followed by panhysterectomy with bilateral salpingo-oöphorectomy in eight to ten weeks, assuming that the patient is a reasonably satisfactory risk. Otherwise radium therapy alone or associated with external irradiation is employed. If the uterine enlargement is particularly marked or irregular, if submucous tumors or accompanying adnexal lesions are present, or if the cervix is manifestly abnormal, immediate panhysterectomy and bilateral salpingo-oöphorectomy is the procedure of choice. If, however, supravaginal hysterectomy appears for some reason to be indicated, the cervix, if abnormal, is treated first by cautery or endothermic resection, together with curettage. The entire question is one of individualization rather than standardization of treatment.

In this series, 114 patients were suspected of having carcinoma of the fundus, and preliminary curettage confirmed the diagnosis in 106. Thirteen patients were not suspected of fundal carcinoma. Diagnostic curettage was performed in 5 of these, all in the postmenopausal group, and in all led to discovery of cancer and appropriate therapy.

There were associated fibromyomata in 37.8 per cent of the group who underwent operation. Previous operative procedures of a pelvic nature had been done in 30.7 per cent of the series.

The authors have extended more and more their use of surgery with preliminary radium application, while irradiation alone has been used less frequently. Postoperative x-ray therapy in patients who have been operated upon after preliminary radium irradiation is given only when there is evidence of extension of the disease outside the uterus and in cases of recurrence.

The results of treatment with surgery alone and with surgery and irradiation are presented at length. Twenty-six patients received the combined treatment prior to Sept. 1, 1937, showing a five-year salvage of 38.4 per cent, or 42.9 per cent if only those patients in whom hysterectomy was done are considered. Of 24 patients treated by surgery and irradiation between 1937 and 1942, 23 are alive one to four years (4 for four years and 5 for three years).

Summing up their results in all 75 cases seen between 1921 and 1937 the authors give the following data:

Alive 5 to 18 years: 14 (18.6 per cent)
Corrected for non-carcinoma deaths, 5 to 15 years: 25 (33.3 per cent)
Five-year salvage, including carcinoma deaths, 5 to 8 years: 29 (38.6 per cent)

As to the relationship of grade of malignancy to treatment, no unalterable conclusion is reached. Low-grade lesions appear to respond equally well to irradiation and surgery, but it seems that the survival rate in intermediate and high-grade lesions is materially improved when irradiation has been a factor in the treatment, either singly or in combination with surgery. Prognosis based on the grade of malignancy alone is uncertain; it is only one of various factors to be considered.

STEPHEN N. TAGER, M.D.

Treatment of Carcinoma of the Prostate. E. W. Riches, I. G. Williams, and A. Haddow. Brit. J. Radiol. **16:** 187–198, July 1943.

This discussion of prostatic carcinoma was opened by Riches, who considered the surgical aspects. He stated that about 20 per cent of enlarged prostates are carcinomatous. Two types of cancer are found, the scirrhous type, which arises in a normal gland, and the adenomatous type, which is frequently associated with a preceding hypertrophy. The average age is 66. The prognosis is better in the older patients.

The symptoms in the order of frequency are: frequency, dysuria, acute retention, hematuria, backache, loss of weight, and pain on sitting. Backache and pain on sitting usually suggest metastasis and are ominous signs.

The diagnosis depends on the finding of a hard and enlarged gland on rectal examination. It is easy in the advanced case, but may be impossible in the early case, until a specimen may be obtained by endoscopy.

An x-ray examination should be made of the lumbar spine and pelvis for metastasis. Lymph node metastases are found in 77 per cent of the cases; metastases in the viscera in 34 per cent, and in the bones in 28 per cent.

Complete cures are rare. Twenty-four cases treated by suprapubic cystotomy alone showed an average survival of nine months. Fifty-one patients treated by endoscopic resection survived an average of seventeen months without irradiation and twenty months with irradiation. The irradiated patients were more comfortable. Sixteen patients treated by prostatectomy survived an average of twenty-one months without radiotherapy and forty-two months with irradiation. Only 2 patients were treated with radium alone. They showed an average survival of 6 months.

Williams, continuing the discussion from the radiotherapist's point of view, stated that so far no case of primary carcinoma of the prostate has been cured by radiation alone. The longest survival with x-ray therapy alone in his series of cases was thirty-nine months, with surgery alone sixty months. The average survival with irradiation alone was 9.5 months (when no metastases were present); with prostatectomy alone 10.5 months; with prostatectomy and x-rays 28 months. When metastases were present the average survival under roentgen irradiation alone was 7.9 months. The average survival with radium implantation was 5.2 months.

While irradiation cannot be relied upon to relieve obstructive symptoms, there is sometimes relief out of proportion to the reduction in the size of the prostate. Irradiation of metastases usually gives surprising symptomatic relief, even greater than from drugs.

One reason for the poor results is that the disease is advanced when the diagnosis is made; 22 per cent of the cases are beyond treatment when first seen.

Haddow concluded the discussion, reviewing the work of Gutman and his associates on the relation of serum acid phosphatase and the diagnosis and course of prostatic carcinoma and of Higgins and his associates on the effect of castration. He reviews briefly the history of the use of castration and advises caution for the present in interpreting the results.

SYDNEY J. HAWLEY, M.D.

Torsion of the Spermatic Cord with Unsuspected Testicular Tumor. John H. Mohardt. Illinois M. J. **84:** 389–393, December 1943.

Torsion of the spermatic cord is relatively common and is often mis-diagnosed as acute epididymitis, orchitis, or strangulated hernia. Torsion usually occurs in the 20- to 30-year age group. Onset of pain is sudden and soon followed by swelling, with the testicular mass palpable high in the scrotum and the epididymis rotated anteriorly or laterally. Surgical exploration for reduction of the torsion and, if necessary, orchiectomy for gangrene are the preferred methods of treatment.

The author's patient, 26 years old, suddenly experienced excruciating pain in the right testicle, when reaching for a distant object while in a twisted position. After conservative treatment for ten days with no relief, needle aspiration yielded 10 c.c. of clotted blood, and the diagnosis was changed from acute orchitis to torsion of the spermatic cord with necrosis. Surgical exploration revealed the expected findings but microscopic examination of sections from the removed testicle showed an unsuspected embryonal carcinoma in its center. Radiation therapy was given, 2,500 r being administered in 10 fractions to the anterior right pelvis and right scrotum and a similar dose posteriorly, through portals 20 × 20 cm. The factors were 800 kv.; 10 ma.; 1.0 mm. Pb, 1.56 mm. Sn, 2.62 mm. Cu, 3.0 mm. Al filtration; 70 cm. F.S.D. At the time of the report, two years after treatment, repeated Friedman tests showed no evidence of recurrence and chest films remained negative.

A brief discussion is included concerning the classification of testicular tumors, the greater radiosensitivity of seminoma over teratoma, the necessity of postoperative irradiation in either case, and the value of the Friedman test in differential diagnosis and in determination of metastatic growth.

LESTER M. J. FREEDMAN, M.D.

Retroperitoneal Tumours in Children. Frederick Pilcher. Canad. M. A. J. **48:** 505–510, June 1943.

Wilms' tumors (embryomas of the kidney) account for the greatest number of retroperitoneal neoplasms in childhood, and the greater part of this paper is devoted to their consideration.

Embryomas are probably of congenital origin and are chiefly unilateral, although bilateral cases have been reported. The tumor is usually large, well encapsulated, and destroys the kidney by pressure. Hemorrhagic, cystic, or necrotic areas may be found, although the mass is usually solid. Metastasis probably occurs most frequently by invasion of the renal vein.

The most common first symptom is an abdominal mass, usually discovered accidentally. Pain, loss of weight, anemia and pressure symptoms, as constipation, edema and dyspnea, are evidence of far advanced disease. Gross hematuria occurs in about 15 per cent of cases and is a bad prognostic sign.

Retrograde or intravenous pyelography is the most valuable aid to diagnosis, as it will establish the presence of a normal kidney on the other side, which is important before proceeding with operation. After a short but thorough preliminary examination and preoperative preparation, immediate removal is advisable. The few weeks required for preoperative radiotherapy may be enough to permit metastasis. Following operation, preferably transperitoneally (Cabot's incision), postoperative radiotherapy may be considered.

Second in frequency among childhood retroperitoneal tumors is neuroblastoma. This is a malignant tumor most commonly arising in the adrenal medulla, although it may arise in sympathetic nerve tissue elsewhere. Differentiation from Wilms' tumor may be difficult or impossible; the exact location and nature of the abdominal mass may be determined only at operation.

M. L. CONNELLY, M. D.

Cancer Associated with Acanthosis Nigricans: Review of the Literature and Report of a Case of Acanthosis Nigricans with Cancer of the Breast Helen O. Curth. Arch. Surg. **47:** 517–552, December 1943.

Acanthosis nigricans is a benign skin disease characterized by an exaggeration of the cutaneous folds and

a brown or black discoloration. The axilla is the most common site of involvement. The palms and soles may show hyperkeratoses, and papillomas, pigmented spots, or warty changes may accompany the typical cutaneous manifestations. The disease is of two types: the one, incorrectly termed malignant, is associated with cancer elsewhere, usually in an internal organ; the other, not so associated, is termed benign. Of 395 cases reported in the literature, 196 were of the malignant and 196 of the benign type, and the other 3 were not classified. Macroscopic and microscopic features of the two types are identical, but the high coincidence of the disease with cancer can hardly be accidental. Sometimes partial regression of the acanthosis nigricans is observed following an attempt to remove the cancer, and recurrence of the acanthosis with recurrence of the cancer has been observed.

The case of a woman with a cancer of the breast and a fibromyoma of the uterus accompanied by acanthosis nigricans is reported. The acanthosis regressed following a radical mastectomy (November 1938), but began to reappear in about four months, although no overt evidence of recurrence of the cancer was observed. The areas principally involved by the acanthosis nigricans were given "six treatments with filtered roentgen rays" without effect [no data as to dose or technic]. The patient died in June 1940. At necropsy cancer metastases were found in the liver, the left adrenal, and the left kidney.

The incidence of acanthosis nigricans is low, but it has been reported from all parts of the world and in all races. Sex distribution is about equal, and the average age is 40 3/4 years. In those cases associated with cancer, the cancer originated in the stomach in about two-thirds, and in 80 to 90 per cent the cancer was intra-abdominal. Adenocarcinoma was the most frequent type, but a few others were noted, including an occasional sarcoma. No proof that these cancers were epidermal in origin has been adduced, although the idea has been proposed. All of the neoplasms associated with acanthosis nigricans were highly malignant.

The cause of acanthosis nigricans is not clear. Toxins affecting the sympathetic nervous system and adrenal damage have been mentioned. Although the condition occasionally is associated with diseases other than cancer, no close relationship has been demonstrated. Puberty seems to activate the condition in some instances, especially the non-malignant cases. A familial history has sometimes been elicited; this would account for the benign cases, in which the patient may not have lived long enough for the development of cancer which might otherwise be anticipated. It would also account for the fact that there is no consistent chronologic relationship between the development of acanthosis nigricans and cancer in the individual. The concept of a genetic relationship seems best to account for the observed facts. A very full bibliography accompanies this article.

LEWIS G. JACOBS, M.D.

Surgical Treatment of Malignant Lymphoma. Edward A. Gall. Ann. Surg. **118:** 1064–1070, December 1943.

Forty-eight cases of malignant lymphoma of all types, sufficiently localized to permit radical excision, are presented. The question of radical excision of these localized tumors *versus* irradiation therapy is discussed and the conclusion is drawn that the life expectancy is greater with surgery than with irradiation alone. If the surgeon is not confident that he has removed all foci of involvement, then irradiation is indicated. Preoperative irradiation is advised only to shrink a bulky tumor in order to make the surgical procedure less difficult. In 21 of the series here recorded postoperative irradiation was done, the dose varying from 600 to 1,800 r, but the author is unable to assess the value of this procedure.

There were 23 known deaths in this series of cases, though not all were due to lymphoma. Nineteen patients were alive at the time of the report, and 18 of these had been symptom-free for three or more years. The remaining 6 patients were unaccounted for, though 3 of them had been under observation after operation 2.6, 3.5, and 8 years, respectively. Recurrences were observed in 23 patients—at an average of 2.2 years after surgery.

Exclusive of the two patients who disappeared immediately after discharge from the hospital, the average postoperative survival period for all cases was 5.2 years and the over-all total duration from the date of onset was 6.9 years. These figures are, respectively, two times and almost three times the levels of similar figures obtained from identical cases treated by other means.

G. A. CREEL, M.D.

Acute Lymphatic Leukemia in Childhood. Dorothy Falkenstein and Willis M. Fowler. Am. J. Dis. Child. **65:** 445–454, March 1943.

Acute lymphatic leukemia is not infrequently encountered in childhood and presents little difficulty in differential diagnosis when the typical clinical and hematologic features are present. In many instances, however, atypical manifestations cloud the picture and the diagnosis becomes more difficult. This is particularly true when the total leukocyte count is not significantly elevated and the differential formula does not present the usual preponderance of immature cells. It is now recognized that these so-called "aleukemic" or "subleukemic" forms constitute a considerable proportion of the total number of cases. In order to compare the incidence, course, and manifestations of the aleukemic and of the more typical variety with an elevated leukocyte count, the authors reviewed 61 cases of acute lymphatic leukemia in patients under sixteen years of age.

The total leukocyte counts at the time of admission to the hospital ranged from 1,900 to 1,000,000 per cubic millimeter. Patients with a leukocyte count of 12,000 or less were considered to be in an aleukemic stage. On the basis of this figure, 32 patients were in the leukemic and 27 in the aleukemic phase at the time of admission to the hospital. One patient died before a leukocyte count was done; on a second patient only a blood smear was obtained before death. Three of the 27 patients admitted to the hospital in the aleukemic phase subsequently changed to the leukemic stage, and 4 of the 32 patients admitted in the leukemic stage later had an aleukemic phase. Of the 26 patients less than six years of age, 17 were leukemic and 8 were aleukemic; the remaining patient was one of the 2 for whom the type was not determined.

In respect to onset, course, and symptoms, there are no essential differences between patients with an elevated leukocyte count and those with a normal or low total leukocyte count. Fatigue and malaise were among the entrance complaints of 17 of the patients

with a high leukocyte count and of 9 of those in an aleukemic stage. Pallor and loss of weight were common in both forms. Enlargement of the nodes was a more prominent feature of those cases in which the circulating lymphocytes were increased. The nodes were discrete and movable and as a rule were not tender and did not suppurate. Enlargement of the spleen was observed in 47 children and of the liver in 39. Both were more common in patients with an increased leukocyte count.

Difficult breathing and cough were noted in 15 patients prior to admission, and in 11 of these a leukemic blood picture was present. On roentgen examination of the chest, a widened mediastinum due to enlarged mediastinal nodes was found in 17 cases. In one patient, a cough produced by mediastinal obstruction was a particularly distressing feature. The cough was dry and rasping and was made worse by recumbency. The superficial veins of the anterior thoracic wall and neck were prominent, and examination revealed signs of pleural effusion on the left. Roentgen therapy to the mediastinum resulted in subsidence of the dyspnea and regression in the size of the mediastinal mass, and, although death occurred in three months, there was no recurrence of the cough or dyspnea after therapy.

In 30 of the cases, the onset of the leukemia followed closely an acute infectious process of some type but, as acute infections of various types are common in children of this age group, the association may have been purely coincidental. The leukemia may have preceded the infection and so have lowered the resistance of the child that he was particularly susceptible to an infectious process. It is also possible that an unrecognized leukemia may have been present and the superimposed infection may have aggravated the symptoms to the point that they became apparent.

Hemorrhage of some degree was observed in 30 of the patients prior to admission to the hospital and purpura in 17 patients. A far greater number displayed hemorrhagic manifestations later in the disease.

Pains referable to the bones or joints were recorded in 19 of the 61 cases, being somewhat more frequent in the aleukemic type. Roentgen evidence of bone involvement may be found in certain cases, although there is no correlation between this and the presence of pain, nor are the roentgen features of a type which is pathognomonic of leukemia. Changes are more frequently found in the bones containing hemopoietic marrow and may be confined to the periosteum. The lesions may be either osteoclastic or osteosclerotic; the most frequent feature is a narrow transverse zone of lessened density proximal to the metaphysis of a long bone. In the skull and pelvis the most common lesion is a generalized osteoporosis which is irregular and mottled in appearance.

The course of the leukemia was acute and rapidly progressive except in one patient who lived for fourteen months after the onset of symptoms. The average duration of life from the first symptoms until death in children for whom the time of death was known was eighteen weeks. This was the same for the leukemic and the aleukemic patients. In 9 of the 18 patients who died under observation in the hospital death was due to complications or superimposed infections. One child died of respiratory failure preceded by extreme cyanosis from mediastinal obstruction; four succumbed to lobar pneumonia, and one to otitis media. Six children died as a result of profuse uncontrollable hemorrhage and one with a convulsion resulting from cerebral hemorrhage. Three died from progressive weakness and anemia. Two patients were moribund on admission.

High-voltage roentgen therapy was tried for 15 children with enlarged mediastinal nodes and for children in whom pressure manifestations from enlarged nodes were present. Such therapy relieved the pressure symptoms and made the patient more comfortable. Roentgen therapy to the liver, spleen, or nodes in the absence of pressure symptoms did not improve the patient's condition nor prolong life. In fact, in some instances it apparently made the condition worse by greatly increasing the already elevated metabolic rate and hastened the fatal outcome. Transfusions were administered to 34 patients and were found to be of slight palliative benefit only.

NON-NEOPLASTIC DISEASE

Roentgen-Ray Treatment of Acute Inflammatory Conditions. George E. Pfahler. Pennsylvania M. J. **47:** 225–228, December 1943.

This paper is a general review of irradiation in acute inflammatory conditions, based on reports in the literature. The author believes that Freund in 1897 was the pioneer in this field. At first, only chronic inflammations, such as tuberculous adenitis, keloids, osteomyelitis, ringworm of the scalp, and acne vulgaris were treated. Later, acute inflammations, such as erysipelas, boils, carbuncles, gas gangrene, acute otitis media, acute mastoiditis, and even acute general peritonitis, tonsillitis and tonsillar abscesses, were found to respond favorably. It is believed from the results of experimental research and from clinical observation that the improvement shown following x-ray therapy is due to the destruction of leukocytes and the consequent liberation of antibodies.

The general principles of technic should be kept in mind rather than any fixed formula applied by some author for a particular purpose. "The more acute the disease, the larger the area treated, and the younger the patient, the smaller should be the dose; and if repetition is necessary the shorter should be the interval." The quality of the radiation should be such that 30 to 50 per cent will reach the affected area. In chronic inflammations, one must be cautious about repetition, and the total dosage must always be considered. Failure to keep account of the total dose in any given length of time has often brought roentgen therapy into bad repute.

In cases of gas gangrene the author quotes Kelly as saying that patients treated early will respond favorably in most cases.

Boils and carbuncles can be checked if treated early or their termination can be hastened.

In erysipelas, irradiation may be considered almost as a specific in adults, but children do not respond well.

Both acute and chronic thrombophlebitis have been treated with good results. In the acute cases 100 to 150 r is given, using 140 to 160 kv. with 3.0 mm. Al in superficial cases and 0.3 mm. Cu plus 1.0 mm. Al in deeper lying inflammations. One treatment may be sufficient.

In general the lymphoid tissue in tonsillitis and pharyngitis is very radiosensitive. The dosage should be between 50 and 100 r per sitting.

In postoperative parotitis x-ray therapy brings about a marked reduction in the death rate. In some cases only one treatment is necessary and good results have been obtained even when suppuration supervened.

For acute mastoiditis the author quotes Shillinger as advocating that x-ray be used as a prophylactic agent in all simple suppurations of the middle ear. The subjective symptoms of mastoiditis are enumerated and the syndrome of favorable action after the use of x-ray therapy is described. JOSEPH T. DANZER, M.D.

An Evaluation of Roentgen Therapy in Disease of the Sinuses. C. L. Crang. Canad. M. A. J. **49:** 117–119, August 1943.

Irradiation is generally held to be of benefit in sinus disease because it destroys lymphocytes and releases antibodies and enzymes, producing a process similar to the normal response to infection. It is only in cases with marked lymphocytic infiltration in the mucosa, therefore, that roentgen therapy is indicated. In the average case of acute sinusitis, which responds well to ordinary measures for promotimg drainage, irradiation will frequently relieve the headache and hasten recovery. In acute fulminating types, if treatment is to be of any value it must be given early in the disease before invasion of the bone. The best results are obtained in the subacute types of infection. Chronic sinusitis with hyperplastic changes responds well if there is no sclerosis of the bony wall. Irradiation is of little value in chronic atrophic sinusitis or sinusitis of allergic origin.

The author uses 135 kv., 0.25 mm. Cu and 1.0 mm. Al filter, 40 cm. distance, giving 100 r in air twice a week for four or five treatments, through an anterior portal about 5 inches in diameter. For disease of the posterior ethmoids or sphenoidal sinuses he prefers two anterior oblique fields, which, by overlapping, permit a greater depth dose. He reports a series of 57 cases, with excellent results in 46 per cent, fair results in 14 per cent, and poor results in 40 per cent.

It is pointed out that favorable results will be obtained only if cases are studied in co-operation with a rhinologist and are carefully selected for treatment.

M. L. CONNELLY, M.D.

Treatment of Asthma with the Roentgen Ray. I. I. Kaplan and Sidney Rubenfeld. Am. J. Roentgenol. **50:** 791–796, December 1943.

The results of roentgen irradiation in 66 patients with asthma are analyzed and discussed. Treatment consisted in the administration of unit doses of 100 to 150 r measured in air, twice or three times weekly until a dose of 600 r was given (200 kv., 5–20 ma., 0.5 mm. Cu plus 1.0 mm. Al). Usually the thorax was irradiated with an open field at 40 to 50 cm. distance, alternating anteriorly and posteriorly until each side received 600 r. The patients had all been carefully studied clinically, sensitivities had been determined, and corrective measures introduced. The cases had been referred to the radiation therapy clinic because of failure with other methods of treatment.

Of 56 patients receiving irradiation over the thorax, 36 were relieved of their anxious spasms at the end of one series of 600 r. Eight patients needed 700–800 r before they exhibited relief. In 5 cases irradiation was given over the cervical sympathetic chain, and these exhibited little or no response. Treatment over the spleen in 4 cases produced complete relief from the paroxysms. Recurrence of attacks is, unfortunately, the rule rather than the exception. In general, the longer and more severe the illness, the more favorable the response to irradiation. Aggravation of symptoms often preceded amelioration.

L. W. PAUL, M.D.

Radiation Therapy of Acute Subdeltoid Bursitis. Arthur A. Brewer and Oscar C. Zink. J. A. M. A. **122:** 800–801, July 17, 1943.

The authors describe the syndrome accompanying acute subdeltoid bursitis as being rather typical. There is usually rather sudden onset of severe pain in the shoulder with no history of significant trauma. Exquisite point tenderness may be elicited over the area of the subdeltoid bursa, with pain radiating down the arm. There is limitation of motion and muscle spasm. The patient is apprehensive about any attempts to move the arm, and there is no doubt that he is in severe pain. The subacute and chronic types present similar but less pronounced symptoms.

In typical cases there is roentgenographically demonstrable calcium deposition just lateral to the greater tubercle of the humerus, described by Codman as calcification within the supraspinatus tendon (Boston M. & S. J. **154:** 613, May 31, 1906).

For therapy the physical factors employed were 200 kv., 18 ma., 0.5 mm. copper and 1.0 mm. aluminum filter, 50 cm. target-skin distance, and 10 × 15 cm. port over the anterolateral aspect of the involved shoulder. Usually a single dose of 300 r was given. In 11 of 14 cases, this treatment was followed by aggravation of symptoms for as long as twenty-four hours, after which spectacular relief permitted the resumption of normal activity within forty-eight hours. If relief does not occur in forty-eight hours, the authors suggest that operative removal of the bursa be considered.

The results in treatment of the chronic type have not been nearly so spectacular, only about 30 per cent of the patients treated obtaining any degree of relief.

DEPARTMENT OF ROENTGENOLOGY
UNIVERSITY OF MICHIGAN (R. H. M.)

Treatment of Plantar Warts. J. E. Gendreau and Origène Dufresne. Canad. M. A. J. **49:** 35–37, July 1943.

Roentgen therapy is considered the method of choice for plantar warts since it curbs mitosis of the hyperplastic cells and makes the horny hyperkeratotic layer exfoliate. Various technics are discussed. The authors use a single moderately intensive dose of filtered radiation, which is repeated after a month if necessary. Of 38 cases thus treated 31 (81.5 per cent) were cured. In 3 cases contact therapy was used, with a single dose of 700 to 900 r (2 cm. distance, 1 mm. Al filter), and good results were obtained in all.

If the lesions are multiple, they should be separately treated, starting with the mother wart; if they are inflamed, treatment should be postponed a week or two; if they do not disappear following a single intensive dose or two doses at an interval of a month, treatment should be discontinued because of the danger of a radiodermatitis.

When plantar warts do not respond to roentgen therapy, negative electrolysis, diathermocoagulation, electrodesiccation, fulguration, or cryotherapy is used.

Diathermocoagulation seems to be the most reliable and convenient of these measures.

M. L. CONNELLY, M.D.

Some Data Concerning the Use of X-Ray Beams in Direct (Cross Firing) Opposition. C. W. Wilson. Brit. J. Radiol. **16:** 247–249, August 1943.

By means of graphs the ratio of the center dose to the surface dose (with back-scatter) is given for various field sizes, various skin-target distances, and qualities.

SYDNEY J. HAWLEY, M.D.

EFFECTS OF RADIATION

Fractures of the Rib Cage Following Interstitial Radium Therapy for Cancer of the Breast. Hoke Wammock and Robert K. Arbuckle. Am. J. Roentgenol. **50:** 609–615, November 1943.

The authors' experience has demonstrated that bone is not so radioresistant as was formerly thought and that permanent damage can result from a therapeutic dose applied to a nearby neoplasm. They present a group of 10 patients in whom fractures of the ribs followed treatment by interstitial radium element needles for cancer of the breast. These patients had remained free of clinical evidence of cancer for periods ranging from four to nine years.

The method used consists of the application of platinum needles with a wall thickness of 0.8 mm., some 44 mm. long, containing 2 mg. of radium, and the remainder 60 mm. long, containing 3 mg. of radium. The irradiated area extends from the sternum to the posterior axillary line and from the supraclavicular fossa to the costal margin. Needles are placed so that they lie parallel to each other and 1.5 cm. apart, on a plane just beneath the tumor, either just above or just below the fascia. Two rows are generally used, the ends of the needles overlapping slightly. The average amount of radiation delivered is 22,000 mg. hr. Two patients received roentgen therapy prior to the interstitial application of radium.

Fractures of the ribs were noted on chest roentgenograms which were made at intervals for detection of pulmonary metastases. There was no history of trauma and no evidence of local or metastatic cancer. Some patients gave no symptoms referable to the rib cage. In others, symptoms were insignificant. The number of ribs fractured varied from one to five. In most instances the fractures appeared in less than two years.

The authors conclude that these rib changes are the result of a non-neoplastic post-gamma irradiation effect, brought about by an interference with the blood supply of the ribs. It is therefore evident that adult bone is not resistant to therapeutic irradiation directed to a nearby neoplasm. CLARENCE E. WEAVER, M.D.

Spontaneous Rib Fractures Following Irradiation for Cancer of the Breast. Asa B. Friedmann. Am. J. Roentgenol. **50:** 797–800, December 1943.

A case is reported in which, following heavy irradiation for an adenocarcinoma of the breast with axillary and supraclavicular and local skin metastases, there developed as a sequel to the irradiation late degenerative changes in the brachial plexus, ribs, and skin, with benign pathological fractures of six ribs and motor and sensory disturbances of the arm. The disease remained arrested over a seven-year period. The bone changes following heavy radiation are those of progressive fibrosclerosis with a resultant closing of the circulation in the haversian systems and the periosteal vessels. The bones become devitalized and brittle and fracture easily. Because of the bone death the fractures do not heal but they also are insensitive. L. W. PAUL, M.D.

Some of the Effects of Roentgen Irradiation on the Cardiovascular System. John E. Leach. Am. J. Roentgenol. **50:** 616–626, November 1943.

In experiments on adult rats it was found that at least 10,000 r delivered in a single dose was necessary to produce microscopic evidence of myocardial damage. The pericardium and endocardium of these animals were intact. In another group of animals followed for over a year and given single doses up to 7,500 r through a single portal, no late changes such as muscular atrophy or myocardial fibrosis were found.

Eighty-five patients undergoing radiation therapy for cancer were observed over a four-year period. Some of these had treatment over various parts of the body not including the thorax, another group had treatment to various regions including the thorax, and a third group received treatment solely to the thorax. In general, there was a drop in the blood pressure at the height of the irradiation reaction. Factors chiefly responsible were thought to be insufficient nourishment with weight loss, anemia, tumor infection, toxemia, fever, and tumor cachexia rather than the depressing effect of the roentgen rays themselves. Ten patients showed different arrhythmias of all types. These, with one exception, were present before roentgen therapy was instituted and followed the same course seen in patients not subjected to irradiation. There was no conclusive evidence that chronic pericarditis and pleuropericardial adhesions were the result of irradiation. In 4 patients a rather marked carotid sinus syndrome developed during the course of roentgen therapy. This was probably due to the pressure of infected metastatic nodes on the carotid sinus rather than any specific action of the roentgen rays. The venous pressure may be elevated and the circulation time may be prolonged. This may be due to angulation of the left innominate vein and superior vena cava associated with irradiation pleuropulmonitis in the upper right lung field. Changes in the electrocardiogram may result from changes in the position of the heart in the chest. This change in position may be quite marked when the left lung is irradiated. It is probable that electrocardiographic alterations are due to changes in the direction of the electrical pathways and are not the result of myocardial disease.

The author concludes that he has found no evidence that the heart has been damaged by roentgen therapy as it is used today in the treatment of cancer.

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